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## CHAPTER XIII

### HOUSEHOLD FORMULAS

The reader is requested to consult the INDEX in all matters relating to this section, as many of the formulas are necessarily classified elsewhere as "ACCIDENTS AND EMERGENCIES," "BEVERAGES," "CEMENTS," "CLEANSING, BLEACHING, RESTORING, POLISHING, etc.," which includes "Laundry Work, etc.," "ICE CREAM AND CONFECTIONERY," "DYEING," "INSECTICIDES," "LEATHER (BLACKINGS AND POLISHES)," "PAINTS, VARNISHES, etc.," "PRESERVING, CANNING, PICKLING," "SOAPS AND CANDLES." Also the MISCELLANEOUS FORMULAS. With the aid of the INDEX everything can be found.

#### Birds.

**Antiseptic Wash for Cage Birds.**—Chinosol, R., 2 dr.; burnt sugar, 20 m.; aq. cinnamon, 4 oz.; aqua, 20 oz. Add 1 or 2 teaspoonfuls to the bath water and allow the birds to use it, when it will quickly destroy all parasites or germs in the feathers. To wash out the cages, use a mixture of 1 tablespoonful in 1 pt. of hot water.

**Canaries.**—Asthma.—Tincture of capsicum, 5 dr.; spirits of chloroform, 90 min.; soluble iron citrate, 45 grams; fennel water, 3½ oz. Give a few drops on lump sugar, in the cage, once daily.

**Food.**—Yolk of egg, dried, 2 parts; poppy heads, in coarse powder, 1 part; titllef, bone, in coarse powder, 1 part; granulated sugar, 2 parts; powdered soda, 8 parts. The granulated sugar may be omitted.

**Massage.**—The following ingredients are mixed into a stiff paste, which is passed over the bird with a sieve: Pea meal, 8 parts; sweet almonds, 2 parts; fresh butter, 1 part. The butter must be unadulterated. A little honey may be added, if desired.

**Constipation of Birds.**—Fluid extract of manna, 2 dr.; syrup of manna, 1 oz.; water, enough to make 4 oz. Give 5 drops of the liquid on a lump of sugar once daily.

**Arrhœca.**—Tincture of iron chloride,

2 dr.; paregoric, 2 dr.; caraway water, 3½ oz. Give a few drops on a lump of sugar once daily.

**Manna.**—Sweet almonds, 8 oz.; wheat flour, 16 oz.; capsicum, ½ oz.; yolk of eggs, enough; honey, enough. Blanch the almonds, reduce them to a smooth paste, and add the flour, capsicum, and enough yolk of eggs and honey to form a mass which may be worked into small cakes.

**Mocking Bird Food.**—1.—Hemp seed, 3 parts; toasted wheat bread, 2 parts; maw seed, 1 part; ox heart, 1 part. Boil the ox heart well in water, cut it small, and place it in a pan in an oven, where it must be allowed to become perfectly dry and crisp. All the ingredients must then be thoroughly mixed and ground in a mill to coarse powder.

2.—Mix together, corn meal, 2 parts; pea meal, 2 parts; moss meal, 1 part; add a little melted lard, but not sufficient to make the mixture too greasy, and sweeten with molasses. Fry in fryingpan for half an hour, stirring constantly, and taking care not to let it burn. This makes it keep well. Put it in a covered jar.

3.—Hemp seed, 16 av.oz.; rape seed, 8 av.oz.; cracker, 8 av.oz.; rice, 2 av.oz.; corn meal, 2 av.oz.; capsicum, 2 av.oz.; lard oil, 2 fl.oz. Mix all together but the oil, grind to coarse powder, and then incorporate the oil.

**Ointment for Healing.**—Peru balsam, 60 gr.; cola cream, 1 oz. Apply.

**Red Birds, Food for.**—Sunflower seed, 8 oz.; hemp seed, 16 oz.; canary seed, 10 oz.; cracked wheat, 8 oz.; unshelled rice, 6 oz. Mix, and grind to a coarse powder.

**Seed, Mixed.**—Sicily canary, 10 oz.; German rape, 2 oz.; Russian hemp, 1 oz.; German millet, 3 oz.

**Tonica.**—1.—Iron sulphate, ½ oz.; diluted sulphuric acid, ½ dr.; water, enough to make 20 oz. A tablespoonful of this mixture is to be added to each quart of the drinking water.

2.—Powdered capsicum, 20 gr.; powdered gentian, 1 dr.; ferric oxide, 4 dr.;

Always consult the Index when using this book.

# Household Formulas

## (Cellars)

sugar, 4 dr.; molasses, enough. Form a mass, and cut into pieces of about 5 gr. each, one of which is to be placed in the cage daily.

3.—For coughs, asthma, congestion of the lungs, etc., in all kinds of songbirds. A certain cure for soft moult. Dose, 3 to 6 drops in the water: *Tr. ferri perchlor.*, 1 dr.; *ac. hydrochlor.* oil,  $\frac{1}{2}$  dr.; glycerine,  $\frac{1}{2}$  dr.; *aq. camph.*, 1 oz. Mix, and filter.

**Candles.** (See SOAP AND CANDLES chapter.)

**Canning.** (See special chapter.)

**Carpets, Preservation of.**

Lay sheets of lining under the carpet. This gives a soft feeling to the foot, and by diminishing the wear adds longer life to the carpet; at the same time it tends to keep away the air and renders the apartments warm.

**Ceilings.**

1.—Ceilings that look very rough, and manifest a tendency to peel, should be gone over with a solution of 1 oz. of alum to 1 qt. of water. This will remove the superfluous lime and render the ceiling white.

2.—*Cracked Ceilings, Filling for.*—Whiting, mixed with glue water or calcined plaster and water, makes a good putty for filling cracks in plastered ceilings.

**Cellars.** (See also WATERPROOFING.)

1.—*Damp, Remedy for.*—Take old preserve cans and put therein calcium chloride, 1 lb. of this salt sufficing for a large cellar. The same attracts the water from the air, which collects in the cans. This, however, is not poured away, but is evaporated on a strong fire, whereby the salt crystallizes again, and becomes fit for renewed use. Especially for potato cellars this process is very serviceable, since the sprouting of the potatoes, though not entirely prevented, is considerably retarded thereby.

2.—*Mold, Extermination of.*—Unslaked lime is best suited for this purpose. The same is blown, in the shape of fine powder, on the walls of the cellar and into the joints and crevices, by means of a bellows, or else thrown on with the hand. The walls must be damp; dry walls have to be well moistened previously. The lime slakes with the adhering water and kills all organisms. On the day following the walls are washed off, and, as expe-

## (Disinfectants)

rience has proved, the cellar will remain free from mold for at least 2 years.

**Chimney Cleaner.** (See also Soot below.)

The chemical chimney cleaner is a compound in powdered form, made up in packages, to put on a hot fire, when it evolves gases which have the effect of carrying off a good deal of the soot in a chimney. The instructions for use are, to make a hot fire, then put the package on and put a blower up in front of the fire (if it is an open grate), and in a few minutes the contents of the package have effected their purpose.

1.—Parts by weight: Copper sulphate, 7; coarse salt, 6; ammonium chloride, 8; saltpeter, 5; fine sand, 2; coke dust, 2. Well mix. Can be colored with any inert material, such as red ochre, if desired.

2.—Parts by weight: Chloride of sodium, 7; potassium nitrate, 4; flour sulphur; cuprous sulphate, 7; muriate of ammonia, 8; color as above, if desired.

**Cleansing.** (See special chapter.)

**Disinfectants.**

For information about some common disinfectants, see our *Scientific American Supplement* No. 1740.

*Chlorides.*—1.—Aluminum sulphate, 6 oz.; zinc chloride,  $1\frac{1}{2}$  oz.; sodium chloride, 2 oz.; calcium chloride, 3 oz.; water, enough to make 2 pt.

2.—Zinc, in strips, 4 oz.; lead carbonate, 2 oz.; chlorinated lime, 1 oz.; magnesium carbonate,  $\frac{1}{2}$  oz.; aluminum hydrate,  $1\frac{1}{2}$  oz.; potassium hydrate,  $\frac{1}{2}$  oz.; hydrochloric acid, 16 oz.; water, 16 oz.; whiting, enough. First dissolve the zinc in the acid, then add the other salts singly, in the order named, letting each dissolve before the next is added. When all are dissolved add the water to the solution, and after a couple of hours add a little whiting to neutralize any excess of acid; then filter. It may be added that zinc chloride ranks very low among disinfectants, and that the use of such solutions as these, by giving a false sense of security from disease germs, may be the means of spreading, rather than of checking the spread of sickness.

*Formaldehyde.*—1.—Gaseous Formaldehyde.—In disinfecting with formaldehyde gas it is essential that the compartments to be disinfected be tightly closed, so that a sufficient concentration of the gas may be held in contact with the infected substances a sufficient length of time. The temperature of the air is an important

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factor in securing efficient action, the formaldehyde being much more energetic in a warm atmosphere than in a cold. The best authorities state that gaseous formaldehyde disinfection should not be attempted if the temperature of the air is below 50° F. The gas is most conveniently secured by liberating it from the concentrated aqueous 40% solution or from the solid paraform.

2.—**Formaldehyde.**—Solutions of formaldehyde are best prepared by making a 5% solution of formalin in water. This is applied directly to substances that require disinfection, and in the case of refuse, excreta, and similar substances, should be thoroughly mixed with them. A 5% solution of formalin is generally regarded as superior to carbolic acid of the same strength, as a general disinfectant.

3.—**Spraying.**—In this method the formalin is sprayed upon the surface of objects which require disinfection, or upon sheets, which are hung up in the compartment containing the infected materials. The gas is liberated by simple evaporation, this liberation being favored by the wide surface which is exposed. The gas is liberated much more slowly by this method than by either of those already described, and the diffusion is also relatively much slower. For these reasons, the compartment to be disinfected should not be very large, and should remain closed for at least 24 hours. Not less than 10 oz. of formalin should be used for each 1,000 cu. ft. of space.

**Household Disinfectants.**—What is ordinarily meant by a disinfectant for use about the house is a deodorizing antiseptic. Copperas, on account of its cheapness, is most frequently used, and is efficient. The fault found with it is that it produces rust stains and unsightly discolorations wherever it is used. This does not interfere with its usefulness in stables, outhouses, drains, etc., but is an objectionable feature. Salts of alumina, especially the sulphate, answer the purpose better for use about the house, but are, of course, more costly. A strong solution of chloride of zinc, prepared by dissolving scrap zinc, or zinc oxide, to saturation in muriatic acid, is of much greater intrinsic value as a disinfectant, and, on the whole, is probably the best thing to recommend. The only objection to it is that it is poisonous, and it should never be sold without a poison label. Among the disinfectants said to be especially useful in destroying foul odors is thymol, which may be most conveniently used in

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the form of an alcoholic solution, to be employed with a spray apparatus. The following are typical formulas:

1.—Iron sulphate, 8 oz.; ammonium chloride, 1 oz.; corrosive sublimate, 1 dr.; alcohol, 4 oz.; water, to make 32 oz. Dissolve the iron sulphate in 24 oz. of water, and the corrosive sublimate in the alcohol. Mix both solutions, add the ammonium chloride and enough water to make 32 oz. Mix with equal parts of water, and use as a disinfectant.

2.—Alum, 10 oz.; sal soda, 10 oz.; sal ammoniac, 2 oz.; common salt, 2 oz.; chloride zinc, 1 oz.; muriatic acid, commercial, q. s.; water, quantity sufficient to make 1 gal. Dissolve the alum in  $\frac{1}{2}$  gal. of boiling water, then add the sal soda, which gives a precipitate of aluminum hydrate. Muriatic acid is then added in sufficient quantity to dissolve this precipitate, thereby forming aluminum chloride. The other salts are then dissolved in the remainder of the water and added to the first solution. The advantages claimed for this preparation are cheapness, ease of preparation, odorless, non-poisonous, and its adaptability for general use. Its freedom from iron, in the disinfection of clothing, is an important point, inasmuch that it will not injure the fabric in any way.

3.—Aluminum chloride, 24 oz.; zinc chloride, 6 oz.; sodium chloride, 12 oz.; calcium chloride, 18 oz.; water, enough to make 1 gal. Moisten the aluminum and calcium salts separately, then mix, and allow to settle. Decant the clear liquid, and in this dissolve the other salts.

4.—Alum, 10 oz.; sodium carbonate, 10 oz.; ammonium chloride, 2 oz.; sodium chloride, 2 oz.; zinc chloride, 1 oz.; hydrochloric acid, 1 fl. oz.; water. Dissolve the alum in  $\frac{1}{2}$  gal. of boiling water, then add the sodium, which will precipitate the aluminum hydrate. Hydrochloric acid should now be added in sufficient quantity to dissolve the precipitate. The other salts should be dissolved in 3 pt. of water; this should be added to the first solution, and enough water added to make 1 gal.

5.—Zinc strips, 2 lb.; hydrochloric acid, 24 oz.; water, sufficient to make 1 gal. Mix the acid and water, and place into the mixture the zinc. When solution is obtained, test for free acid, which should be avoided.

6.—Litharge, 9 oz.; nitric acid, 6 oz.; water, 1 gal. Dissolve the litharge in the acid and water, previously mixed. Tin waste or scraps, such as old tin cans, tin boxes, etc., may be utilized to make a

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disinfectant fluid by placing them into a wooden barrel or cask containing dilute muriatic acid, the acid solution gradually dissolving the tin and iron precipitate and producing a cheap and effective preparation.

7.—Eckstein finds that bleaching powder is the most effective disinfectant for privies, urinals, etc., inasmuch as it rapidly decomposes hydrogen compounds, such as ammonia, sulphureted hydrogen, etc. It is conveniently applied in a bag made of parchment paper, through which the disinfectant slowly passes by osmosis. Comparative experiments made in a chemist's house (where at least 100 persons use the closets daily) gave the following results:

a.—Two pounds of sulphate of iron (green vitriol), dissolved in water, prevented the production of smell for 2 or 3 hours, and had wholly lost its preservative action in 12 hours.

b.—Sulphate of copper in solution produced the same result.

c.—Two pounds of solid sulphate of iron, or sulphate of copper, acted as a disinfectant for 2 full days.

d.—A mixture of iron and copper sulphates and carbonate of lime (2 lb. in all) only remained active for 2 days.

e.—Solution of sulphurous acid lost its action quickly; it was perceptible to the respiratory organs for an hour.

f.—Crude carbolic acid filled the house with a peculiar tarry odor for 2 days. This was so powerful that it could not be determined whether the smell of the fecal matter was decomposed or merely hidden by a more powerful odor.

g.—Two pounds of sulphate of iron in a parchment paper bag only became active after 2 hours, and remained active for full 3 days, at the end of which time the bag contained a muddy liquor destitute of smell.

h.—Two pounds of good commercial bleaching powder in a parchment bag became active in 2 hours, and remained efficacious for 9 full days, without in the least affecting the respiration or smell.

i.—Crude permanganate of soda disinfected immediately, but only lasted for 1 day. In a parchment paper bag the same quantity lasted 2 days.

j.—As regards remedies which prevent the further development of spores, the following results were obtained. The first number means retarding the development, the rest totally preventing it:

### (Disinfectants)

Corros. sublimate	1:1,600,000	1:320,000
Oil of mustard..	1:330,000	1:33,000
Arsenite of pot..	1:100,000	1:10,000
Thymol .....	1:80,000	
Oil of turpentine	1:75,000	
Hydrocyanic acid	1:40,000	1:8,000
Oil of peppermint	1:33,000	
Chromic acid....	1:10,000	1:5,000
Picric acid.....	1:10,000	1:5,000
Iodine .....	1:5,000	
Salicylic acid...	1:3,300	1:1,500
Pernang. of pot.	1:3,000	
Muriatic acid...	1:2,500	1:1,700
Camphor .....	1:2,500	
Eucalyptol .....	1:2,500	
Benzoic acid.....	1:2,000	
Borax .....	1:2,000	1:700
Carbolic acid....	1:1,250	1:300

Recent researches have demonstrated that many of the agents which have been found useful as deodorizers, or as anti-septics, are entirely without value for the destruction of disease germs. Anti-septic agents, however, exercise a restraining influence upon the development of disease germs, and their use during epidemics is to be recommended when masses of organic material in the vicinity of human habitations cannot be completely destroyed or removed or disinfected. A large number of the proprietary "disinfectants," so called, which are in the market are simply deodorizers or antiseptics of greater or less value, and are entirely untrustworthy for disinfecting purposes.

k.—Ferric chloride, 4 parts; zinc chloride, 5 parts; aluminum chloride, 5 parts; calcium chloride, 4 parts; magnesium chloride, 3 parts; water, sufficient to make 90 parts. Dissolve, and add to each gallon 10 gr. of thymol and  $\frac{1}{4}$  oz. of oil of rosemary, previously dissolved in about 6 qt. of alcohol, and filter.

*Instruments, Disinfection of.*—1.—Sterilize coarse building sand by roasting. Fill a suitable vessel with this, and pour in a 4% corrosive sublimate solution or a 50% solution of "Lysol" (a trade-marked disinfectant), till the sand is thoroughly soaked; keep covered with a sterilized piece of pasteboard, pass all instruments through this 3 or 4 times.

2.—A 10% solution of boroglycerine in water will sterilize forceps, broaches and cutting instruments, and leave them without unpleasant odor.

*Odorless Disinfectants.*—1.—Ferric chloride, 4 parts; zinc chloride, 5 parts; aluminum chloride, 5 parts; calcium chloride, 4 parts; manganese chloride, 3

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parts; water, 69 parts. If desired, 10 gr. of thymol and 2 fl.dr. of oil of rosemary, previously dissolved in about 12 fl.dr. of alcohol, may be added to each gallon.

2.—Alum, 10 parts; sodium carbonate, 10 parts; ammonium chloride, 2 parts; sodium chloride, 2 parts; zinc chloride, 1 part; hydrochloric acid, sufficient; water, 100 parts. Dissolve the alum in about 50 parts of boiling water and add the sodium carbonate. The resulting precipitate of aluminum hydrate dissolve with the aid of just sufficient hydrochloric acid, and add the other ingredients, previously dissolved in the remainder of the water.

3.—Mercuric chloride, 1 part; cupric sulphate, 10 parts; zinc sulphate, 50 parts; sodium chloride, 65 parts; water, to make 1,000 parts.

*Perfumed Disinfectant.*—To remove the inconvenience suffered by travelers through the disinfecting process of quarantine stations, Gawolowski recommends the application of a disinfectant prepared by introducing sulphurous acid gas at a low temperature into alcohol until saturated, and then adding thymol and suitable perfumes.

*Sick-Room Disinfectants, and How to Use Them.*—The National Board of Health, consisting of a number of our leading physicians and chemical experts, of which Prof. C. F. Chandler was chairman, have issued the following instructions for disinfection, intended especially for yellow fever districts, but which are equally applicable in other classes of contagious diseases. No reliance can be placed on disinfectants simply because they smell of chlorine or carbolic acid, or possess the color of permanganate, and that, in general, proprietary disinfectants with high-sounding names are practically worthless, as they either have no value whatever, or, if of value, cost many times as much as they are worth, and cannot be used in sufficient quantity.

Explanations.—Disinfection is the destruction of the poisons of infectious and contagious diseases. Deodorizers, or substances which destroy smells, are not, necessarily, disinfectants, and disinfectants do not necessarily have an odor. Disinfection cannot compensate for want of cleanliness or of ventilation.

1.—Disinfectants to be Employed.—a.—Roll sulphur, brimstone, for fumigation.

b.—Sulphate of iron, copperas, dissolved in water in the proportion of  $1\frac{1}{2}$  lb. to the gal.; for soil, sewers, etc.

c.—Sulphate of zinc and common salt,

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dissolved together in water in the proportions of 4 oz. of sulphate and 2 oz. of salt to the gallon; for clothing, bed linen, etc.

Note.—Carbolic acid is not included in the above list for the following reasons: It is very difficult to determine the quality of the commercial article, and the purchaser can never be certain of securing it of proper strength; it is expensive when of good quality, and experience has shown that it must be employed in comparatively large quantities to be of any use; it is liable by its strong odor to give a false sense of security.

2.—a.—The most available agents are fresh air and cleanliness. The clothing, towels, bed linen, etc., should be at once, on removal from the patient, placed in a pail or tub of the zinc solution, boiling hot, if possible, before removal from the room. All discharges should either be received in vessels containing copperas solution, or, when this is impracticable, should be immediately covered with copperas solution. All vessels used about the patient should be cleansed with the same solution. Unnecessary furniture, especially that which is stuffed, carpets, and hangings, when possible, should be removed from the room at the outset; otherwise, they should remain for subsequent fumigation and treatment.

b.—Fumigation with sulphur is the only practicable method for disinfecting the house. For this purpose the rooms to be disinfected must be vacated. Heavy clothing, blankets, bedding, and other articles which cannot be treated with zinc solution, should be opened and exposed during the fumigation, as directed below. Close the rooms as tightly as possible, place the sulphur in iron pans supported upon bricks, set it on fire by hot coals, or with the aid of a spoonful of alcohol, and allow the room to remain closed for 24 hours. For a room about 10 ft. square at least 2 lb. of sulphur should be used; for larger rooms proportionately increased quantities.

c.—Premises, cellars, yards, stables, gutters, privies, cesspools, waterclosets, drains, sewers, etc., should be frequently and liberally treated with copperas solution. The copperas solution is easily prepared by hanging a basket containing about 60 lb. of copperas in a barrel of water.

d.—Boys and Bed Clothing, etc.—It is best to burn all articles which have been in contact with persons sick with contagious or infectious diseases. Articles too valuable to be destroyed should be



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treated as follows: (1) Cotton, linen, flannels, blankets, etc., should be treated with the boiling hot zinc solution, introducing piece by piece, securing thorough wetting, and boiling for at least half an hour. (2) Heavy woollen clothing, silks, furs, stuffed bed covers, beds, and other articles which cannot be treated with the zinc solution, should be hung in the room during fumigation, pockets being turned inside out, and the whole garment thoroughly exposed. Afterward they should be hung in the open air, beaten and shaken. Pillows, beds, stuffed mattresses, upholstered furniture, etc., should be cut open, the contents spread out and thoroughly fumigated. Carpets are best fumigated on the floor, but should afterward be removed to the open air and thoroughly beaten.

e.—The corpses should be thoroughly washed with a zinc solution of double strength, then wrapped in a sheet wet with the zinc solution, and buried at once. Metallic, metal-lined, or airtight coffins should be used when possible, certainly when the body is to be transported for any considerable distance.

f.—Zinc sulphate, 64 fl.oz.; sulphuric acid, 4 fl.dr.; nitrobenzol, 1 dr.; indigo blue, 0.5 gr. Place about 1 dr. in the bedpan before using. Contact with urine or liquid stools determines prompt solution of this salt, deodorization and sterilization being instantaneous. The excreta are also thus preserved for microscopical examination.

g.—Guaiacol, 50 grams; eucalyptol, 40 grams; menthol, 20 grams; carbolic acid, 30 grams; thymol, 10 grams; oil of cloves, 5 grams; alcohol, q. s., 1,000 grams. To be sprayed about, with water.

h.—Liquid for Sanitary Spraying.—This, for use in the chambers of the sick, is composed of 10 parts of eucalyptol, 3 parts of thyme oil, as much lemon oil, and the same quantity of lavender oil, in 110 parts of alcohol of 90°. To 1 pt. of water add 1 teaspoonful of this liquid.

*Sponges, Sterilization of.*—A very simple process for the sterilization of sponges, which does not change the physical properties of the sponges, is given by Elsberg in the *Chemiker Zeitung Repertorium*. Allow the sponges to lie for 24 hours in an 8% hydrochloric-acid solution, to eliminate lime and coarse impurities, wash in clean water, and place the sponges in a solution of caustic potash, 10 grams; tannin, 10 grams; water, 1 l. After they have been saturated for 5 to 20 minutes with this liquid they are washed out with sterilized water or a solution of carbolic

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acid or sublimate, until they have entirely lost the brown coloring acquired by the treatment with tannin. The sponges thus sterilized are kept in a 2% or 15% carbolic solution.

#### Drain Pipes, Testing.

1.—The following "smoke test" is recommended by a writer who has tested it. Ignite soiled cotton waste and sulphur, and blow the smoke into the drain or pipes. If the leakage exists in the latter, inside of the house, the smoke and smell both issue forth, and generally tell where the fault lies. Sulphur, as is well known, is one of the best disinfectants, and a dose of the fumes from this to the drains, after disease has been in the house, would effect much good. (See also *Sinks, Waste Pipes*.)

2.—*Smoke Cartridge for Testing.*—Potassium nitrate, 1 oz.; manganese dioxide,  $\frac{1}{2}$  oz.; rosin,  $\frac{1}{2}$  oz.; asphaltum,  $\frac{1}{4}$  oz. Mix.

#### Dust Cloth, Oiled.

1.—Saturate a suitable piece of cloth with kerosene, and lay it aside until the surplus oil has evaporated. Rub it on a wooden surface until it no longer leaves a streak, and it is ready for use. This cloth should be well shaken after each use, and re-oiled about once a month.

2.—Mix 30 parts of paraffine with 10 parts of double refined rape-seed oil, heat moderately, and stir into it 1 part of melted benzoin (gum benjamin). Immerse the cloths in this liquid so as to become entirely saturated with it; wring out well, and dry in a shady place. The cloths do not injure even polished furniture, but rather enhance the brilliancy.

*Dyeing.* (See special chapter.)

#### Electric Light Bulbs, Coloring.

1.—White shellac, 3 oz.; powdered rosin, 1 oz.; benzoin, 1 dr.; alcohol, 10 oz.; aniline dye (any color), enough. Apply to the bulbs.

2.—First, make a solution by mixing the white of 1 egg, previously beaten to a froth, with 1 pt. of soft water. Filter, and be sure that no bubbles remain on the surface of the liquid. The globes should be carefully cleaned and polished, and then dipped into this solution and hung up by a string to dry. After about half an hour they should be dipped the second time, to insure a perfect coating. When perfectly dry they are ready for the coloring solution. This is made by dissolving from 10 to 30 gr. (according

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to the density of color desired) of any soluble aniline dye in 4 oz. of collodion. Dip the globes in this solution and hang up to dry again. If they are not dark enough they can be dipped again after the first coat has become dry, which usually requires about 6 hours.

3.—Aniline dyes are used for coloring the bulbs of incandescent lamps. These may be dissolved in amyl acetate or in photosec. br's collodion. The bulbs should be cleaned thoroughly and dried, coated with the white of egg and again dried. The dye will then adhere firmly to the glass.

4.—Bulbs may be colored temporarily by coating them with collodion in which has been dissolved aniline dye. Such a coloring soon bakes and peels off, and it has been suggested that it may ignite, and set fire to anything combustible which may be near it. The possibility of accident from this source, however, seems remote. Water glass in place of collodion has been suggested.

5.—Another method is to dip the bulb into a saturated solution of alum and allow the liquid to dry on it. The solution may be colored with cochineal for red, turmeric for yellow, indigo for blue, and so on. Aniline dyes may be employed. Epsom salt in hot solution has been tried in place of the alum, but presumably with less satisfactory results.

**Enamel Paints.** (See special chapter on PAINTS, etc.)

**Filters.** (See **Water**, below.)

**Fireproofing.** (See special chapter.)

**Floors.** (See also **Carpets**, **Linoleum**.)

**Ballroom Floors.**—1.—Glissade Powder.—Boric acid, 1 lb.; terpineol,  $\frac{1}{2}$  oz. Mix. Put up in tins with perforated lids. To be dusted evenly over the surface of the floor before the dancing commences.

2.—Perfume for Ballroom Floor Gloss.—Oil of lavender,  $\frac{1}{2}$  oz.; oil of verbena, 20 minims; oil of neroli, 20 minims.

**Dust Absorbent.**—1.—This dust-absorbing agent has for its object to take up the dust in sweeping floors, etc., and to prevent its development. The production is as follows: Mix in an intimate manner 12 parts (by weight) of mineral sperm oil with 88 parts (by weight) of Roman or Portland cement, adding a few drops of mirbane oil. Upon stirring, a uniform paste forms at first, which then passes into a greasy, sandy mass. This mass is sprinkled upon the surface to be swept and cleaned of dust, next going over it with a broom or similar object, in

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the customary manner, at which operation the dust will mix with the mass. The preparation can be used repeatedly.

2.—For drawing-rooms, etc.: White vaseline oil, 600 parts; raw linseed oil, 800 parts; patchouli oil, 2 to 4 parts.

3.—For offices, stores, factories, etc.: (a) Yellow vaseline oil, 1,000 parts; linseed oil, 1,000 parts. (b) Rape-seed oil, 1,000 parts; linseed oil, 1,500 parts. (c) Yellow vaseline oil, 1,000 parts; rape-seed oil, 500 parts; linseed oil, 2,000 parts. Although the so-called dustless floor oil does not, of course, create a perfectly dustless room, yet the dust is reduced to a minimum. A drawback presented by the above oils is that any articles falling down are apt to be soiled or ruined.

4.—Paraffine oil, 8 parts; kerosene, 1 part; lime water, 1 part.

5.—Paraffine oil, 1 part; neatsfoot oil, 1 part; cotton-seed oil, 1 part.

**Oil Dressing for Floors.**—1.—Neatsfoot oil, 1 part; cotton-seed oil, 1 part; petroleum oil, 1 part.

2.—Beeswax, 8 parts; water, 56 parts; potassium carbonate, 4 parts. Dissolve

the potash in 12 parts of water; heat together the wax and the remaining water till the wax is liquefied; then mix the two, and boil until a perfect emulsion is effected. Color, if desired, with a solution of annatto.

3.—Paraffine oil, 8 parts; kerosene, 1 part; lime water, 1 part. Mix thoroughly. A coat of the mixture is applied to the floor with a mop.

**Stains for Floors.**—1.—Linseed oil, 1 gal.; Spanish brown, 1 lb.; powdered senna, 2 lb.; litharge, 1 oz. Mix in an old tin pan, heat carefully to the boiling point, take from fire, add 1 pt. of turpentine, and apply with a broad brush. Choose a clear, dry day, and open doors and windows. Next day polish with a waxed cloth wrapped around a block which is fastened to a broom handle.

2.—Red-oak bark, 1 pk.; common tobacco, 2 lb.; copperas, 1 tablespoonful. Boil the bark and tobacco in 2 gal. of water. When well colored, stir in the copperas. Apply, after straining, with a broad brush, and when dry mop with weak lye water. Good for common floors.

**Wax.**—1.—The mixture, which is usually composed of beeswax and oil of turpentine, should have a consistency slightly thicker than the pure turpentine. Extreme care must be exercised in its preparation, in order to procure the exact degree of humidity required. The floor should be perfectly clean and smooth before the preparation of beeswax and tur-

## Household Formulas

### (Floors)

pentine is applied, which latter is best accomplished by the aid of a rag. The quality and general texture of the flooring material will largely determine the quantity of the fluid preparation which will be needful. Hard, close-grained wood will naturally require less than wood which is soft and open, the absorbing power of the latter being much greater. Care must be exercised to apply neither too much nor too little of the wax. To determine the proper amount, experiment with a square foot or two, and leave untouched for 24 hours, or longer, if necessary. In simply waxing a floor the coat must be made as thin as possible, otherwise the grain of the wood will be concealed. When the liquid preparation has become thoroughly dry the treated part should be rubbed thoroughly with a hard brush until a shiny aspect is given it. If a satisfactory polish is produced on the experimental floor patch the entire floor may be similarly treated. If, on the other hand, the luster of the wax is dim and dull, its removal is essential. The best-known means of removing the defective coating is by the aid of fine sandpaper, but in instances where floor waxing is accomplished by simply applying a pomade, the use of fine cork will be found more satisfactory. If the experiments prove the drying to be too slow, a little of the oxidizing compounds, or driers, which are on sale at any paint dealer's, may be used. The proportion of drier to the preparation of turpentine and wax should be about 1 pt. to 6 pt. of the latter.

2.—We are told that in finishing hard wood with a wax polish the wood is first coated with a "filler," which is omitted in the case of soft wood. This seems to be reversing the natural procedure, the softer wood being more porous, but our information comes from an authoritative source. The filler is made from some hard substance, very finely ground; sand is used by some manufacturers. The polish is the same as for soft wood. The simplest method of applying wax is by a heated iron, scraping off the surplus and then rubbing with a cloth. It is evident that this method is especially laborious, and for that reason a solution of the wax is desirable. It may be dissolved rather freely in turpentine spirit, and is said to be soluble also in kerosene oil.

3.—Stearine, 100 parts; yellow wax, 25 parts; caustic potash, 60 parts; yellow laundry soap, 10 parts; water, a sufficient quantity. Heat together until a homogeneous mixture is formed.

4.—Yellow wax, 25 parts; yellow laun-

### (Gas)

dry soap, 6 parts; glue, 12 parts; soda ash, 25 parts; water, a sufficient quantity.

**Furniture.** (See Woodwork.)

**Gas.**

*Freezing of Meters, To Prevent.*—Add glycerine to the water in the proportion of  $\frac{1}{2}$  pt. to 1 gal. of water. Glycerine does not affect the metals of which the meter is composed.

*Leakage, Detection of.*—1.—Dr. Bunte's method for detecting gas leakage, by means of palladium paper, has been rendered still more delicate by Herr Schaufelers, who uses, to every 3 parts of chloride of palladium 1 part of chloride of gold. The increase of sensitiveness may be partly due to catalytic action—that is, to the mere presence of the gold—perhaps to the action of traces of acetylene upon the gold solution. The solution used for making the paper contains  $\frac{3}{4}\%$  of chloride of palladium and  $\frac{1}{4}\%$  of chloride of gold. One pint costs about 9s., and will steep filter paper enough for 8,000 to 11,000 tests. The main sources of error are tobacco smoke, stoves and smoky chimneys, which let carbonic oxide into the room; the vapor of fusel oil, onion smell, mercury vapor and sulphureted hydrogen.

2.—Rub a little soapy water upon the suspected place. The formation of a bubble will show where the leak is.

*Mantles.*—These are prepared after processes based on the original formula of Welsbach—the impregnation of vegetable fibres with certain mineral oxides in solution, drying out, and arranging on platinum wire. The following are good examples of the oxide:

1.—Lanthum oxide, 30 parts; yttrium oxide, 20 parts; burnt magnesia, 50 parts; acetic acid, 50 parts; water, distilled, 100 parts. The salts are dissolved in the water, and to the solution another 150 parts of distilled water are added and the whole filtered. The vegetable fibre (in its knitted or woven form) is impregnated with this solution dried, and arranged on platinum wire. In the formula the acetic acid may be replaced with dilute nitric acid. Indeed, the latter seems to have some advantages over the former, among which is the fact that the residual ash where acetic acid is used has a tendency to ball up and make a vitreous residue, that of the nitric acid remains in powdery form.

2.—Zirconium, ore, 50 parts; lanthanum oxide, 35 parts; yttrium, ore, 16

## Household Formulas

### (Gas Mantles)

parts. Solvents as before. Mix and dissolve, etc.

3.—Zirconium, 60 parts; lanthanum oxide, 99 parts; thorium nitrate, 95 parts. Cerium nitrate may be used in place of the thorium salt.

*Meter, How to Read a.*—The dial marked "1 thousand" in the accompanying illustration is divided into hundreds; the dial marked "10 thousand" is divided into thousands; that marked "100 thousand" into ten-thousands, and that marked "1 million" into hundred-thousands. When 1,000 cu. ft. of gas have

### (Ice)

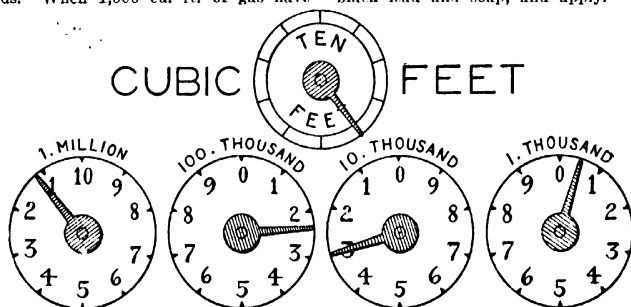
the mechanism and shows that the meter requires attention.

*Pipe, Strength of.*—The thread on a  $\frac{3}{4}$ -in. gas pipe will sustain a weight of 5,000 lb.,  $\frac{1}{2}$  in., 7,000 lb., and  $\frac{3}{4}$  in., 9,000 lb., so that chandeliers cannot readily be shaken from their supports.

**Glass.** (See special chapter.)

**Hinges, To Prevent Creaking.**

Rub a little soap on the hinges; or, make a mixture of equal parts of lard, black lead and soap, and apply.



Gas Meter Indicator Dials

been consumed, the pointer on the dial marked "1 thousand" will have made a complete rotation, and the fact will be indicated by the pointer of the next dial at the left, which will point to the figure 1. When 10,000 cu. ft. of gas have been consumed, the pointer on the "10 thousand" dial will point to 1, and so on. In reading a gas meter, put down the hundreds first, then the thousands, and so on, always counting the figure just under, or which has just been passed by, the pointer. In the illustration about half a hundred is indicated on the "1 thousand" dial, three thousands is indicated on the next dial, two ten-thousands on the next dial, and one one-hundred-thousands on the "1 million" dial. The reading will be 123,050. The dial marked "ten feet" is called the units dial. It is used for testing the meter to discover whether it is in working order or not. Each mark represents a cubic foot and the complete circle 10 cubic feet. If the pointer moves when no gas is burning, it indicates a leak. If it does not move when the gas is burning, or if its motion is unsteady, it indicates a derangement in

### Ice.

*Keeping.*—The use of ice in small quantities, frequently repeated, is very general in many diseases, but it is found difficult to keep it from melting, especially when in small blocks. To obtain this result, the ice should be put in a vessel covered with a plate, which vessel should be placed on a feather bed, and covered with a feather pillow or cushion; feathers being very bad conductors of heat. By this plan a few lb. of ice can be kept several days, even in summer heat.

*Weight.*—*Drug Topics* says that a close estimate of the weight of ice can be reached by multiplying together the length, breadth and thickness of the block in inches, and dividing the product by 30. This will be very closely the weight in lbs. Thus, if a block is 10 x 10 x 9, the product is 900, and this divided by 30 gives 30 pounds as correct weight. A block 10 x 10 x 6 weighs 20 lb. This simple method can be easily applied, and it may serve to remove unjust suspicions, or to detect short weight.

## Household Formulas

### (Kalsomine)

**Insecticides.** (See special chapter.)

#### Kalsomine.

1.—A lime kalsomine or wash, made as follows, is good for cheap work: Take 6 qts. thick lime whitewash made of the best lime slacked in hot water. Mix turps and linseed oil of each  $\frac{1}{2}$  a pint, and stir it in while the wash is hot, then add  $\frac{1}{2}$  lb. of powdered alum. Have the mixture thick enough to cover like kalsomine and put it on with a kalsomine brush. The edges dry slowly, and no matter how much suction there may be in the wall the wash will spread smooth and easy.

2.—Sodium carbonate, 8 parts; linseed oil, 32 parts; hot water, 8 parts; white glue, 12 parts; whitening, 160 parts. Dissolve the sodium carbonate in the hot water, add the oil and saponify by heating and agitation. Cover the glue, broken into small pieces, with cold water and let soak overnight. In the morning pour the whole on a stout piece of stuff and let the residual water drain off, getting rid of as much as possible by slightly twisting the cloth. Throw the swelled glue into a capsule, put on the water bath and heat gently until it is melted. Now add the saponified oil and mix well; remove from the bath, and stir in the whitening a little at a time, adding hot water as it becomes necessary. When the whitening is all stirred in, continue adding hot water until a liquid is obtained that flows freely from the kalsomining brush. The addition of a little soluble blue to the mixture increases the intensity of the white.

3.—Prepared kalsomine can be readily purchased at any large paint store, but some of our readers may wish to prepare their own kalsomine. The following rules are given for the purpose of enabling them to do so:

Soak 1 lb. of white glue overnight, then dissolve it in boiling water and add 20 lb. of Paris white, diluting with water until the mixture is of the consistency of rich milk. To this any tint can be given that is desired.

4.—**Coloring.**—Blue.—A small quantity of Prussian blue will give a soft azure tint. Dark blue is never desirable.

Brown.—Burnt umber.

Buff.—Spruce, or Indian yellow, 2 parts, and burnt sienna, 1 part.

Gray.—Raw umber, with a trifling amount of lampblack.

Lavender.—Make a light blue and tint it slightly with vermilion.

Lilac.—Add to the kalsomine, Prussian blue, 2 parts and vermilion, 1 part, stir-

### (Lamps)

ring the mixture thoroughly and taking care to avoid too high a color.

Delicate tints in the foregoing varieties of colors are always agreeable and tasteful, and so great care must be taken that they are not too vivid. The tints will always appear brighter than in the kalsomine pot, and this fact must be kept in mind when adding the coloring powders.

#### Kindlings.

1.—Save the corncobs for kindlings, especially if wood is not going to be plentiful next winter. To prepare them, melt together rosin, 60 parts, and tar, 40 parts. Dip in the cobs, and dry on sheet-metal heated to about the temperature of boiling water.

2.—Dip the wood in melted rosin. The following composition is sometimes used: melted rosin, 60 parts; tar, 40 parts, in which the wood is dipped for a moment. Or, take tar, 1 qt.; rosin, 3 lb.; melt them, then cool; mix as much sawdust with a little charcoal added as can be worked in. Spread out on a board and when cold break up into lumps the size of a hickory nut, and you will have enough kindling to last a good while.

3.—Use the cheapest rosin and add about 2 oz. of tallow to each lb. of the rosin. Melt the rosin first and add the tallow. Either smear over small blocks of wood or mix with sawdust and pour into molds made of boards, which can be knocked apart and the mass broken up.

4.—Wooden sticks, of suitable length, are dipped in petroleum, turpentine, etc., and tied together in bundles. Dry wood is disposed about these and it is coated with rosin to prevent the evaporation of the volatile constituents.

#### Lamps.

##### *Chimneys, To Prevent from Breaking.*

—Put them on the fire in a vessel filled with cold water, add a little coarse salt, heat gradually until it boils, and then cool slowly. This process may be applied also to objects of crockery or porcelain. In this way the objects are annealed, and the slower the operation, especially in the cooling of the water, the stronger will they become. If a glass chimney is cut with a diamond on the convex side, it will not break, for the cutting facilitates the dilatation produced by the heat.

**Leather.** (See special chapter.)

**Laundry Work.** (See **CLEANSING** chapter.)

# Household Formulas

## (Paperhanging)

### Linoleum, Oilcloth, etc.

*Linoleum, Dressing for.*—1.—A weak solution of beeswax in spirits of turpentine has been recommended for brightening the appearance of linoleum.

2.—Palm oil, 1 oz.; paraffine, 18 oz.; kerosene, 4 oz. Melt the paraffine and oil, remove from the fire and incorporate the kerosene.

3.—The *Bulletin de la Société Royal de Pharmacie de Bruxelles* gives the following directions for keeping linoleum mats bright: Treat first with a mixture in equal parts of milk and water. Let this dry on the surface, then apply the following mixtures: Yellow wax, 3 parts; carnauba wax, 6 parts; oil of turpentine, 30 parts; benzine, 31 parts. If the mat is subjected to much service the first preparation appears to be the best, while if but light, either of the others will answer.

*Composition for Linoleum, Oilcloth and Other Coated Articles.*—This is composed of whitening, dried linseed oil and any ordinary dryer, such as litharge, to which ingredients a proportion of gum tragacanth is to be added, replacing a part of the oil and serving to impart flexibility to the fabric and to the composition in a pasty mass the property of drying more rapidly. In the production of linoleum the whitening is replaced in whole or in part by pulverized cork. The proportions are approximately the following by weight: Whitening or powdered cork, 13 parts; gum tragacanth, 5 parts; dried linseed oil, 5½ parts; siccativ, ½ part.

*Polish.*—a.—Yellow ceresin, ½ oz.; paraffine, 2½ oz.; boiled linseed oil, 1½ oz.; oil of turpentine, 5 oz.

b.—White ceresin, 1 oz.; paraffine, 2 oz.; oil of turpentine, 5 oz.

c.—Palm oil, 2½ oz.; carnauba wax, 5 dr.; yellow ceresin, 2½ dr.; oil of turpentine, 6 oz.

d.—Take yellow wax, 5 oz.; oil turpentine, 11 oz.; amber varnish, 5 oz. Melt the wax, add the oil and then the varnish. Apply with a rag.

*Oilcloth.* (See *LINOLEUM*.)

**Paints.** (See special chapter on *PAINTS, VARNISHES, etc.*)

### Paperhanging.

To prepare the walls, make a size of glue and water, then give the walls a coat of a very weak solution of the same. To make a paste, take 2 lb. of fine flour, put in a pail, add cold water and stir it up together in a thick paste. Take a piece of alum about the size of a small chestnut, pound it fine and throw it into the paste; mix well. Then provide about 6 qt. of

## (Plaster)

boiling water and mix while hot with the paste until the whole is brought to a proper consistency. This makes an excellent paste and fit for use when cold.

*Wall Paper.*—The following table from the *New York Newsdealer* shows how many rolls of wall paper are required to cover a room of the dimensions indicated by the figures in the left hand column, also the number of yards of border necessary:

Size of Room.	Height of Ceiling.	Number of Doors.	Number of Windows.	Rolls of Paper.	Yards of Border.
7x9.....	8	1	1	8	11
7x10.....	9	1	1	7	11
7x9.....	10	1	1	8	11
7x9.....	12	1	1	10	11
8x10.....	8	1	1	7	12
8x10.....	9	1	1	8	12
8x10.....	10	1	1	9	12
8x10.....	12	1	1	11	12
9x11.....	8	1	1	8	14
9x11.....	9	1	1	10	14
9x11.....	10	1	1	11	14
9x11.....	12	1	1	13	14
10x12.....	8	1	1	9	15
10x12.....	9	1	1	10	15
10x12.....	10	1	1	11	15
10x12.....	12	1	1	13	15
11x12.....	8	2	2	8	16
11x12.....	9	2	2	9	16
11x12.....	10	2	2	10	16
11x12.....	12	2	2	13	16
12x13.....	8	2	2	8	17
12x13.....	9	2	2	10	17
12x13.....	10	2	2	11	17
12x13.....	12	2	2	14	17
12x15 or 13x14.....	8	2	2	10	18
12x15 or 13x14.....	9	2	2	11	18
12x15 or 13x14.....	10	2	2	12	18
12x15 or 13x14.....	12	2	2	15	18
13x15.....	8	2	2	10	19
13x15.....	9	2	2	11	19
13x15.....	10	2	2	12	19
13x15.....	12	2	2	15	19
14x16.....	9	2	2	12	20
14x16.....	10	2	2	14	20
14x16.....	12	2	2	17	20
14x18.....	9	2	2	13	22
14x18.....	10	2	2	15	22
14x18.....	12	2	2	19	22
15x16.....	10	2	2	15	23
15x17.....	12	2	2	19	22

Deduct one-half roll of paper for each ordinary door or window extra—size 4x7 feet.

**Pickling.** (See *PRESERVING* chapter.)

### Plaster.

*Interior Plastering.—Substance.* Mortars which are used for interior work are called fine, coarse, gauge and stucco.

*Fine Stuff.*—Lump lime is to be slaked with water to a paste and afterward to a cream, after which it hardens by the water evaporating and is ready for work.

## Household Formulas

### (Roofs)

ing. It is now used for what is termed slipped coat, but is ready for finishing coat when prepared with plaster of paris or sand.

**Coarse Stuff.**—Lime paste, 2 parts; sand,  $4\frac{1}{4}$  parts; hair, 1-3 part. There may be less hair used for the second coat.

**Gauge Stuff or Hard Finish.**—This is composed of from  $1\frac{1}{2}$  to 2 parts fine stuff and  $\frac{1}{2}$  plaster of paris. Regulation must be considered as to the rapidity of hardening. For cornices, etc., there will be equal parts fine stuff and plaster.

**Preserving.** (See special chapter.)

**Roof Covering.** (See also PAINTS, etc.; FIREPROOFING AND WATERPROOFING.)

1.—In an iron receiver melt over an open fire 190 kgm. of rosin and add gradually 100 kgm. of anthracite oil. Take from the fire and pour into the receiver 60 kgm. of crude benzol, while stirring carefully. Pour into this mixture, still gradually, 200 kgm. of ordinary bole, while continuing to stir rapidly. Leave it at repose for a time, but filter while the mixture is still warm.

2.—**Fireproof Roofing Paper, Not Brittle.**—Ordinary impregnating tar is boiled with water-glass solution, ordinary roll pasteboard is drawn through the mixture and sprinkled with the finest possible sand. If in place of cardboard jute fabric is used, which it is best to pass first through a bath of water-glass, the roof covering will not be brittle.

3.—**Slate Roofs.**—A square of slate or slating is 100 superficial ft. The lap of slates varies from 2 to 4 in. The pitch of a slate roof should not be less than 1 in. in height to 4 in. in length.

4.—**Tar Paper, Paint for Roofing Paper, etc.**—a.—Distilled coal tar, 70 parts; heavy mineral oil (lubricating oil), 10 parts; American rosin, 20 parts.

b.—Distilled coal tar, 50 parts; Trinidad asphalt, 15 parts; mineral oil, containing paraffine, 10 parts; dry clay, finely ground, 25 parts.

c.—Distilled coal tar, 50 parts; rosin, 15 parts; rosin oil, 5 parts; dry clay-slate, finely powdered, 30 parts.

d.—Distilled coal tar, 70 parts; rosin, 20 parts; linseed oil varnish, 8 parts; finely powdered pyrolusite, 2 parts.

e.—Distilled coal tar, 50 parts; rosin, 15 parts; linseed oil varnish, 7 parts; pyrolusite, 1 part; dry clay, finely powdered, 27 parts.

5.—**Tiles, Coating for.**—First dip in a hot solution of soft soap, and when dry, dip in a strong solution of alum. This treatment has proved most successful.

### (Sinks)

**Rubber Hose.** (See RUBBER chapter.)

**Sealing Wax for Bottles.**

**Bottle Wax.**—1.—Rosin, pitch, ivory black, equal parts.

2.—Rosin,  $6\frac{1}{2}$  parts; beeswax,  $\frac{1}{2}$  part Venetian red or red lead,  $1\frac{1}{2}$  parts.

3.—Shellac, 3 parts; Venice turpentine,  $1\frac{1}{4}$  parts; vermilion,  $2\frac{3}{4}$  parts; or Venetian or red lead, q. s.

4.—Rosin, 6 parts; shellac and Venice turpentine, each 2 parts; coloring matter to suit.

5.—The following recipe is recommended by Scheirer: Burgundy pitch, 50 parts; turpentine, 25 parts; colophony, 100 parts. Heat the pitch until all the water is driven off, then add the turpentine and colophony, and when the whole is liquid, add a mixture of the following in fine powder: Chalk, 50 parts; carbonate of magnesia, 5 parts; Armenian bole, 50 parts. Mix thoroughly.

6.—The ingredients are shellac, 2 lbs.; rosin, 4 lb.; Venice turpentine,  $2\frac{1}{2}$  lb.; red lead,  $1\frac{1}{2}$  lb. Melt the shellac and rosin cautiously in a bright copper pan, over a clear charcoal fire. When melted add the turpentine, and lastly mix in the red lead. Pour into molds or form sticks on a warm marble plate. The gloss may be produced by polishing the sticks with a rag until they are cold.

7.—Dieterich is authority for the following: Gelatine, 1 oz.; gum arabic, 1 oz.; boric acid, 20 gr.; starch, 1 oz.; water, 16 fl.oz. Mix the gelatine, gum arabic and boric acid with 14 fl.oz. of cold water, stir occasionally until the gum is dissolved, heat the mixture to boiling, remove the scum and strain. Also mix the starch intimately with the remainder of the water and stir this mixture into the hot gelatine mixture until a uniform product results. As noted above, the composition may be tinted with any suitable dye. Before using it must be softened by the application of heat.

**Sinks, Cleanliness of.**

One of the most prolific causes of defilement and offensive odors in kitchen sinks and their outlets is the presence of decaying grease. This comes from the emptying of kettles in which meat has been cooked, in the dish-water and in the soap. The grease lodges in every crevice and catches at every obstruction. A remedy may be found in the use of the common alkalis instead of soap, aqua ammonia in washing clothes, and borax in washing lawns and laces, and washing soda in cleaning dishes. These alkalis prevent a

## Household Formulas

### (Stove Blacking)

solid soap from forming in the sink and its pipes and neutralizes all effects of decomposing fat.

**Soaps.** (See special chapter.)

**Soot and Smoke from Coal Fires, Powder to Prevent the Formation of.**

Chalk, 2 oz.; salt, 7 oz.; dried magnesium sulphate, 1 oz. Mix.

**Steam Pipes, etc., Covering for.**

The following is recommended: 1.—Water, 225 parts; potter's clay, 20 parts; fossil meal (infusorial earth), 30 parts; horse or cow hair, 7 parts; linseed oil, 3.5 parts; sifted rye flour, 3.5 parts; beet sugar molasses, 2.5 parts; ultimately, if desired, also 3.5 parts of flaxseed meal.

2.—Linen cottonade, paper, etc., is treated with paraffine, 1 part; rubber, 0.04 part; white lead, 0.75 part; zinc white, 0.8 part; graphite, 0.8 part, and wood shavings, 0.8 part.

3.—The best covering for steam pipes is formed by alternate layers of felted hair and asbestos. Cork has not proved so reliable, as the pores admit the air. Mineral wool, infusorial earth, and magnesium carbonate can also be recommended. As stated in the *Zeitschrift für Elektrochemie*, experiments made to test various coverings show the following results, expressed in comparative values: Alternate layers of felted hair and asbestos, 100; granulated cork, 77; mineral wool, 75; infusorial earth, 71; magnesium carbonate, 70; infusorial earth with hair, 53; asbestos board, 47; infusorial earth with asbestos, 46; crude asbestos, 36; ordinary air-space, 18.

**Stove Pipes.**

**Cleaning.**—A piece of zinc put on the live coals in the stove will clean out the stove pipe.

**Protecting.**—Varnish with: Asphaltum, 2 lb.; boiled linseed oil, 1 pt.; oil of turpentine, 2 qt. Fuse the asphaltum in an iron pot, boil the linseed oil, and add while hot. Stir well and remove from the fire. When partially cooled add the oil of turpentine.

**Stoves.**

**Blacking and Polishes.**—1.—Mix 2 parts of black lead, 4 parts of copperas, and 2 parts of bone black, with water, so as to form a creamy paste. This is an excellent polish, as the copperas produces a jet black enamel, causing the black lead to adhere to the iron.

2.—Plumbago, 2 lb.; water, 8 oz.; tur-

### (Stove Blacking)

pentine, 8 oz.; sugar, 2 oz. Knead thoroughly and keep in tin boxes. Apply with a brush.

3.—Plumbago, make into a thin paste with sodium silicate or water-glass. This makes an excellent stove polish and should be brushed thoroughly.

4.—Pulverized black lead, 2 lb.; spirits of turpentine, 2 gal.; water, 2 oz.; sugar, 2 oz. Mix.

5.—Mix 5 parts black lead, 5 parts bone black and 10 parts of iron sulphate. Use water q. s. to form a paste. This is an excellent preparation and the coating is very permanent.

6.—Reduce graphite to an impalpable powder by grinding in a mill with water, dry; use with water first, then dry and polish. This is the base of nearly all commercial stove polishes.

7.—Turpentine and black varnish, put with any good stove polish, is the blacking used by hardware dealers for polishing heating stoves. If properly put on, it will last throughout the season.

8.—Pulverized black lead, 2 lb.; spirits of turpentine, 2 gal.; water, 2 oz.; sugar, 2 oz.; mix.

9.—Liquid Stove Polish.—Bone black, 2½ parts; pulverized graphite, 2½ parts; copperas, 5 parts; water, q. s. to form a creamy paste.

10.—Pulverized black lead, 1½ lb.; turpentine, 1½ gill; water, 1½ gill; sugar, 1½ oz.

11.—Asphaltum, 5 lb.; melt and add boiled oil, 2 lb.; spirits of turpentine, 1 gal.; mix.

12.—Make a mixture of water-glass and lampblack of about the consistency of thin syrup, and another of finely levigated plumbago and mucilage of Soudan gum (or other cheap substitute for gum arabic), of a similar consistency. After getting rid of dust, etc., go over the stove with mixture number one and let it dry on, which it will do in about 24 hours. Now go over the stove with the second mixture, a portion of the surface at a time, and as this dries, with an old blacking brush give it a polish. If carefully done the stove will have a polish resembling closely that of new Russian iron. A variant of this formula is as follows: Mix the graphite with the water-glass to a smooth paste; add, for each pound of paste, 1 oz. of glycerine and a few grains of aniline black. Apply to stove with a stiff brush.

13.—The following is said to equal the best of the patented preparations: Make two saturated solutions, one of tannic acid in water, and the other of iron sulphate



## Household Formulas

### (Stove Blacking)

in water. Mix 2 parts, by weight, of the iron solution and 3 parts of the tannin and to the mixture add 1 part of good oil blacking, 1 part of lampblack and 5 parts of plumbago and grind the whole together to a smooth paste. Apply as plain blacking is applied.

14.—Graphite (often misnamed black-lead) is the foundation ingredient in a stove polish. Lampblack is frequently added to deepen the color, but the latter form of carbon is of course more readily burned off than the former. The powder variety of stove polish is merely purified and ground graphite, with or without the addition of lampblack, which is applied to the stove by being first mixed with a little water. The paste is made by the addition of glycerine or paraffine oil to the powder.

15.—Graphite in fine powder, 1 lb.; lampblack, 1 oz.; rosin, 4 oz.; turpentine, 1 gal. This form may be esteemed a convenience by some, but the rosin will, of course, give rise to some disagreeable odor on first heating the stove, after the liquid is applied. The mixture must be kept well shaken while in use, and must not be applied when there is a fire or light near on account of the inflammability of the vapor. The solid cakes of polish are said to be made by subjecting the powdered graphite, mixed with spirit of turpentine, to great pressure. It has to be reduced to powder and mixed with water before being applied. Any of them has to be well rubbed with a brush after application to give a handsome polish.

16.—A correspondent of *The Pharmaceutical Era* submits the following formula for a preparation which he says his company advertises as a "dustless paste stove polish": Animal charcoal, 8 parts; blacklead, 8 parts; molasses, 4 parts; sulphuric acid, 2 parts; hydrochloric acid, 1 part; water, enough to make a paste. He says he allows the acids to act on the charcoal and molasses for twenty-four hours, after which the graphite is added with enough water to form a paste. He says that the trouble with this paste is that "it forms a layer on the cloth when applied, and this layer in contact with a warm stove falls as dust to the floor." The French stove polish which is used for blackening and polishing iron stoves is produced in the following manner:

17.—Turpentine oil, French or American, 23.0 kilos; American lampblack, 3.0 kilos; prime black, fat, finely elutriated graphite, 2.5 kilos.

18.—Ceresine, 3.0 kilos; carnauba

### (Waste Pipes)

wax, 0.5 kilo. Melt the ceresine and carnauba wax in a tinned or enameled kettle over a moderate fire and add mixture 3, previously stirred cold, to the fusion, 4, but only at a distance from the fire, with stirring. Pour this mixture through a fine metal sieve into a second vessel, and next, for a more intimate mixture, from one kettle into another until it begins to thicken, and only then fill into tin cans. If the paste should have become a little too cold during the filling of the tins, so that it interferes with the pouring, all that is necessary is to put the vessel into a larger one containing boiling water, whereby it is rendered more liquid again.

**Polishing.**—For a stove of medium size, pulverize a piece of alum the size of a large hickory nut, stir into two table-spoonfuls of vinegar, add this to the stove blacking, mixed with water in the usual manner. Apply this mixture with a cloth or brush to a cold stove, and while wet rub briskly with a dry brush. The polish will appear at once.

**Varnishes.** (See special chapter on PAINTS, VARNISHES, etc.)

### Walls, To Protect from Dampness.

1.—Three-quarters lb. of mottled soap to 1 gal. of water. This composition to be laid over the brickwork steadily and carefully with a large flat brush, so as not to form a froth or lather on surface. The wash to remain twenty-four hours, to become dry. Mix  $\frac{1}{2}$  lb. alum with 4 gal. water; leave it stand twenty-four hours, and then apply it in the same manner over the coating of soap. Let this be done in dry weather.

2.—Thirty parts of tin are dissolved in 40 parts of hydrochloric acid, and 30 parts of sal ammoniac are added. A powder composed of freestone, 50 parts; zinc oxide, 20 parts; pounded glass, 15 parts; powdered marble, 10 parts, and calcined magnesite, 5 parts, is prepared and made into a paste with the liquid above mentioned. Coloring matter may be added. The composition may be used as a damp-proof coating for walls, or for repairing stonework, or for molding statues or ornaments.

**Washing.** (See CLEANSING chapter.)

### Waste Pipes, Cleaning.

One of the most frequent and trying annoyances of housekeeping, as many can testify, is the obstruction to the free, quick outlet of the waste water of the washstand, the bathtub, and the kitchen sink. This is caused by a gradual accum-

## Household Formulas

### (Water, Hard)

mulation of small bits of refuse material, paper, rags, meat, bones, or other offal, which check and finally entirely stop the outflow of the waste water. A simple, inexpensive method of clearing the pipe is as follows: Just before retiring at night pour into the pipe enough *liquid* potash (not *soda*) lye of 30° strength to fill the "trap," as it is called, or bent portion of the pipe just below the outlet. About a pint will suffice for a washstand, or a quart for a bathtub or kitchen sink. Be sure that no water runs into it till next morning. During the night the lye will convert all of the offal in the pipe into *soft soap*, and the first current of water in the morning will remove it entirely, and leave the pipe as clean as new. The writer has never had occasion, in over thirty years' experience, to make more than two applications of it in any one case. The so-called potash lye sold in small tin cans in the shops is not recommended for this purpose; it is quite commonly misnamed, and is called *caustic soda*, which makes a *hard soap*. The lye should be kept in heavy glass bottles or demijohns, covered with wickerwork, and plainly labeled; always under lock when not in actual use. It does not act upon metals, and so does not corrode the pipes as do strong acids.

### Water, Hard.

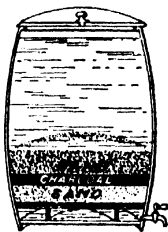
*Softening.*—The invention was a chemical one for expelling chalk by chalk. Chalk consisted—for every pound (16 oz.)—of lime, 9 oz.; of carbonic acid, 7 oz. Nine oz. of lime, which could be obtained by burning in a kiln, required at least 40 gallons of water to dissolve it. This was called lime water. Chalk was very sparingly soluble in water, so that one pound would require 5,000 gallons to dissolve it; but if there was combined with it an additional 7 oz. of carbonic acid, the chalk became readily soluble in water, and when so dissolved it was called bicarbonate of lime. If the quantity of water containing the one pound of chalk, with 9 oz. additional of carbonic acid, were 400 gallons, then the solution would be a water of the same hardness as well-water from the chalk strata, and not sensibly different in other respects. Thus it appeared that one pound of chalk, scarcely soluble in it by either of two distinct chemical changes, could be made soluble by being deprived entirely of its carbonic acid, when it was capable of changing water into lime water, and soluble by combining with a second dose of carbonic acid, making up bicarbonate

### (Water Filter)

of lime. Now, if a solution of the 9 oz. of burned lime, forming lime water, and another solution of the one pound of chalk and 7 oz. of carbonic acid, forming bicarbonate of lime, were mixed together, they would so act upon each other as to restore the two pounds of chalk, which would, after the mixture subsided, leave a bright water above. The water would be free from bicarbonate of lime; free from burned lime, and free from chalk, except a very little. A small residuum of the chalk remained, not separated by the process. Of the 17½ gr. in a gal. of water only 16 gr. would be deposited and 1½ gr. would remain. To soften water on a small scale, it was necessary to provide lime water about one-tenth of the quantity of water to be treated. Two-gallon stoneware casks with wooden taps have been used. The casks were placed near a constant service tap; 1½ pt. of lime water being first put in, the cask should be filled up to two gallons. After standing twenty-four hours, the supernatant water will be as clear as before, and at the bottom of the vessel would be found a precipitate of chalk.

### Water Filter.

1.—To make a filter with a wine barrel, procure a piece of fine brass wire cloth of a size sufficient to make a partition across the barrel. Support this wire cloth with a coarser wire cloth under it and also a light frame of oak, to keep the wire cloth from sagging. Fill in upon the



A Simple Filter

wire cloth about three inches in depth of clear, sharp sand, then two inches of charcoal broken finely, but no dust. Then on the charcoal four inches of clear, sharp sand. Fill up the barrel with water and draw from the bottom.

A Quick Filter.—Take a clear piece of chamois skin, free from thin places, cut it of the desired size, wash it in a weak

## Household Formulas

### (Windows)

solution of soda or any alkali to remove the grease, and rinse thoroughly in cold water before using. Tinctures, elixirs, syrups, and even mucilages are filtered rapidly. A pint of the thickest syrup will run through in four or five minutes. By washing thoroughly after each time of using it will last a long time.

2.—Use two stone pots or jars, as shown in the accompanying engraving, the bottom one being a water jar with side hole, if it can be procured; otherwise, if no faucet can be used, the top jar can be removed to enable the water to be dipped out. The top jar must have a hole drilled



Filter and Cooler

or broken in the bottom, and a small flowerpot saucer inverted over the hole. Then fill in a layer of sharp clean sand, rather coarse. A layer of finer sand, a layer of pulverized charcoal with dust blown out, then a layer of sand, the whole occupying one-third of the jar.

3.—Stone.—K. Steinman, in *Tifenfurt bei Gurlitz*, proposes filtering plates from the following mixture: Clay, 10 parts or 10 or 15; levigated chalk, 1 part or 1 or 1 glass sand, coarse, 55 parts; glass sand, fine, 25 or 65 parts; ground flint, 50 or 5 parts. The ingredients are mixed thoroughly in water, molded, and hard burnt.

**Waterproofing** (See special chapter.)

**Windows, To Prevent Frost and Sweating.**

1.—A number of experiments have shown that far less daylight enters through frozen panes than one would be apt to suppose without previous test. With a moderate amount of frost work on the windows the volume of incident light was diminished at least two-thirds, while

### (Windows)

panes covered with a large quantity of frost admitted only one-fifth of the amount of light traversing the non-frozen windows, other conditions being equal. An occasional consumption of two-thirds to four-fifths of the daylight may be of subordinate significance in summer, but the case is different in winter, even if the eye were only remotely as sensitive to differences in light as the skin is to changes of temperature. It is very essential, therefore, to endeavor to avoid frosty panes, not only in workshops, but in rooms of every description, including bedrooms.

2.—As an excellent remedy against the freezing of shop windows, the *Phar. Zeit.* recommends the application of a mixture consisting of 55 grams of glycerine dissolved in 1 l. of 62% alcohol, containing, to improve the odor, some oil of amber. As soon as the mixture clarifies it is rubbed over the inner surface of the glass. This treatment, it is claimed, not only prevents the formation of frost, but also stops sweating.

3.—*Siccating Windows.*—Perfect ventilation is probably the most effective means within reach. This is effected by making openings in the sash at the top and bottom so as to cause a current of cold air from the outside to traverse the interior side of the glass. In extremely cold weather, or when the air in the store becomes mixed with watery vapors escaping from the portion of the room where pharmaceutical work is performed, there is no effective remedy, if the cause cannot be removed, except by a double sash. The gaslights in that case should be on the outside of the double panes so that the air in the confined space be not heated but kept at a temperature uniform with the outside atmosphere. The appearance of moisture may, in windows arranged in this manner, be greatly diminished by placing a vessel containing sulphuric acid or calcium chloride within the confined space. Another plan which appears very effective is to have a number of gas-jets along the lower sash furnished with a reflector of tin, which throws the heat up along the glass and thus prevents condensation, to which, of course, the moisture, etc., is chiefly due.

4.—Dissolve 55 grams of glycerine in 1 l. of alcohol (63%), to which a little amber oil is added for scent. As soon as the mixture is limpid, the inside surface of the show window is rubbed with it, using a window chamois or a linen rag, whereby not only the freezing, but

## Household Formulas

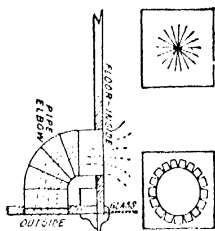
### (Windows)

also the dimming and sweating of the windows is obviated.

5.—To keep frost, etc., off plate glass windows keep the inside air dry, or inner sash tight, so that the air in window enclosure will be cold, and ventilated from the outside. A partial remedy is to have ventilating openings in the top of the window casing.

6.—A thin coat of pure glycerine applied to both sides of the glass will prevent any moisture forming thereon, and will stay until it collects so much dust that it cannot be seen through. Surveyors can use it to advantage on their instruments in foggy weather. In fact, it can be used anywhere to prevent moisture from forming on anything, and locomotive engineers will find it particularly useful in preventing the accumulation of steam as well as frost on their windows during the cold weather.

7.—Take two square pieces of tin and draw circles on them to fit a five-inch stovepipe elbow, as shown in the dotted line in cut, and cut the tin from the center to the circle, as marked in the same drawing. Bend the points back and cut off to leave a flange of about one and a half inches, as shown. Cut a hole 5 inches in diameter in the floor of the window close to the glass, and another hole of the same size through the wall beneath the window, making an opening into the street. Fit the pieces of tin as indicated in cut, and insert the stovepipe as indicated in cut. Place wire netting over both holes. Then cut a few holes at the top of the window to allow the air to circulate. This will keep the windows frostproof in the coldest



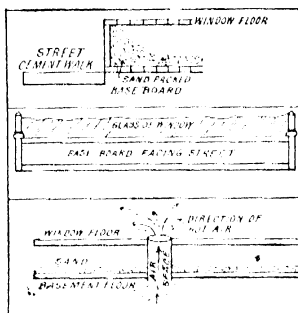
Window Ventilation

weather. This principle, which keeps the air in constant circulation, is a simple one. The air in the window (which was enclosed) is colder and denser and hence has a greater pressure than that in the

### (Windows)

store. It therefore forces itself out through the holes at the top of the window, allowing the cold air from the street to enter at the bottom. Any one who tries this plan will find it very satisfactory, but care should be taken in trimming the floor not to cover the opening with any heavy article that will prevent the free circulation of the air.

S.—Arthur E. Friant, an expert window trimmer, describes the following method in the *Confectioners' Journal*: "I first had two large sections taken up in the window floor so I could see how my windows looked under the space. I found that I could see large cracks, which no doubt let in a great deal of cold air. These cracks I filled with packing, such as is used in caulking seams in a boat. I then filled in the whole space under the window floor with sand about three inches deep. My idea in doing this was to keep all possible dampness out of the window.



Plan of Window, Showing Scheme for Preventing Sweating of Windows

Then I cut a square hole in the floor under the window floor of the platform which led into the basement. The only space for air to come in was through the large hole, which was perfectly tight all around the air-space. The heat from the top of basement naturally would cause a draught in this air-space, from the fact that the air in the window was cooler than the air in the basement, and, as hot air rises because it is lighter than the cold air, the hot air in the basement rose to the window. The doors leading from the store into the window were taken off their hinges, and this allowed the air from

## Household Formulas

### (Wood)

the basement to circulate through the whole window. Then I took a thermometer and tried the temperature of the basement first, then of the window, also of interior of store. They were found to be all of the same temperature. "If you will notice your store doors in the coldest weather you will see that they very seldom freeze or sweat, because the heat of the store strikes the whole glass, and the temperature is alike from bottom of the door to the top. I can step into my windows now with the same amount of comfort that I would walk about the store. In stores without heat in the basement a common lamp placed under the air chamber has been tried and found very successful."

### Woodwork.

#### *Bruises in Furniture, to Remove.*—1.—

To take out bruises in furniture wet the part with warm water, double a piece of brown paper five or six times, soak it and lay it on the place; apply on that a hot flatiron till the moisture is evaporated. If the bruise be not gone, repeat the process. After two or three applications, the dent or bruise will be raised level with the surface. If the bruise be small, merely soak it with warm water, and apply a red-hot poker very near the surface; keep it continually wet, and in a few minutes the bruise will disappear.

2.—If the bruise is very small all that is necessary is to soak it with warm water and apply a red-hot poker near the surface, keeping the spot continually wet until the bruise disappears, which will occur in a few moments.

3.—Polish, to Restore.—When the dent is removed and the wood dry, the polish can be restored by any of the usual processes. If the wood was originally finished in oil, rub with a little boiled linseed cut with acetic acid (oil 8 parts, acid 1 part). If it was "French polished," apply an alcoholic solution of shellac, and let dry; repeat if necessary, and when completely dry proceed as follows: Rub the part covered with shellac, first with crocus cloth and a few drops of olive oil, until the ridges, where the new and old polish come together, disappear; wipe with a slightly greased but otherwise clean rag and finish with putz-pomade. In the case above spoken of (a beautifully polished writing desk) the polish was restored in this manner, and it will now require very close scrutiny to detect the injured spot.

*Furniture Cream.*—1.—Yellow wax, 4 oz.; yellow soap, 2 oz.; water, 50 oz.;

### (Wood)

boil, with constant stirring, and add boiled oil and oil of turpentine, each 5 oz.

2.—Soft water, 1 gal.; soap, 4 oz.; white wax, in shavings, 1 lb. Boil together, and add 2 oz. of pearlsh. To be diluted with water, laid on with a paint brush, and polished off with a hard brush or cloth.

3.—Wax, 3 oz.; pearlsh, 2 oz.; water, 6 oz. Heat together, and add 4 oz. of boiled oil and 5 oz. of spirits of turpentine.

4.—Beeswax, 2,500 parts; potassium carbonate, 25 parts; oil of turpentine, 4,000 parts; water, rain or distilled, 4,500 parts. Dissolve the potassium salt in 1,500 parts of the water, add the wax, rasped or cut up, and boil together until the wax is partially saponified. Add sufficient water to replace that lost by evaporation, remove from the fire and stir until cold. Now add, little by little, and under constant stirring, the oil of turpentine, and continue to stir until a smooth homogeneous emulsion is obtained. When this occurs, add the remainder of the water at once and stir in. If desirable, a little oil of lavender or other essential oil may be used as a perfume. It should be added with or immediately after the oil of turpentine. If a color is desired, soak alkanet root in the oil of turpentine (about an ounce to the quart) before addition.

This paste is said by the Journal of the Austrian Pharmaceutical Association to be one of the best furniture polishes known. The directions are very simple—apply the paste as thinly as possible over the surface to be polished (which, of course, should be first washed with tepid suds, either alone, or, as many housewives prefer, carrying a little gasoline poured on the surface), then rub off with a soft woolen cloth, using "elbow grease q. s." in rubbing.

5.—One pint 90% alcohol,  $\frac{1}{4}$  oz. gum arabic, 1 oz. shellac. Bruise the gums and sift them through a piece of muslin. Place the spirits and gums together in a vessel closely corked, near a warm stove, and frequently shake them: in two or three days they will be dissolved. Strain through a piece of muslin, and keep corked tight.

6.—Shellac, 6 oz.; naphtha, 1 qt.; benzoin,  $\frac{3}{4}$  oz.; sandarac, 1 oz.

7.—Dissolve  $1\frac{1}{2}$  oz. shellac,  $\frac{1}{4}$  oz. sandarac, in  $\frac{1}{2}$  pt. naphtha. To apply the polish, fold a piece of flannel into a sort of cushion, wet it well with the polish, then lay a piece of clean linen rag over the flannel, apply 1 drop of linseed oil;

# Household Formulas

(Wood)

rub your work in a circular direction, lightly at first. To finish off, use a little naphtha, applied the same as the polish.

8.—Pale shellac,  $2\frac{1}{4}$  lb.; mastic and sandarac, each 3 oz.; spirits, 1 gal. Dissolve, and add copal varnish, 1 pt.; mix well by agitation.

9.—Shellac, 12 oz.; wood naphtha, 1 qt.; dissolve, and add  $\frac{1}{2}$  pt. linseed oil.

10.—Crush 3 oz. shellac with  $\frac{1}{2}$  oz. gum mastic, add 1 pt. methylated spirits of wine, and dissolve.

11.—Shellac, 12 oz.; gum elemi, 2 oz.; gum copal, 3 oz.; spirits of wine, 1 gal.; dissolve.

12.—Shellac,  $1\frac{1}{4}$  oz.; gum juniper,  $\frac{1}{2}$  oz.; benzoin,  $\frac{1}{2}$  oz.; methylated alcohol,  $\frac{1}{2}$  pt.

13.—One oz. each of gums mastic, sandarac, seed lac, shellac, and gum arabic; reduce to powder, then add  $\frac{1}{4}$  oz. virgin wax; dissolve in a bottle with 1 qt. rectified spirits of wine. Let stand for twelve hours, and it is then fit for use.

14.—One oz. gum lac, 2 dr. mastic in drops; sandarac, 4 dr.; shellac, 3 oz.; gum dragon,  $\frac{1}{2}$  oz. Reduce the whole to powder.

15.—Boiled linseed oil, 1 pt.; yellow wax, 4 oz.; melt, and color with alkanet root.

16.—Acetic acid, 2 dr.; oil of lavender,  $\frac{1}{2}$  dr.; rectified spirit, 1 dr.; linseed oil, 4 oz.

17.—Linseed oil, 1 pt.; alkanet root, 2 oz.; heat, strain, and add lac varnish, 1 oz.

18.—Linseed oil, 1 pt.; rectified spirit, 2 oz.; butter of antimony, 4 oz.

19.—White soap,  $2\frac{1}{2}$  oz.; spirits turpentine, 80 oz.; white wax, 20 oz.; water, 110 oz.; carbonate potash, 1 oz. Place the soap in a water bath with a portion of the water and melt by a gentle heat, adding the remaining water as fast as absorbed. Now add the wax and increase the heat until it melts. Reduce the heat and add the turpentine gradually, stirring until all is thoroughly incorporated.

20.—White Furniture Cream.—Raw linseed oil, 6 oz.; white wine vinegar, 3 oz.; methylated spirit, 3 oz.; butter of antimony,  $\frac{1}{2}$  oz.; mix the linseed oil with the vinegar by degrees, and shake well so as to prevent separation; add the spirit and antimony, and mix thoroughly.

*Oak, To Darken.*—Oak is fumigated by liquid ammonia, strength 880°, which may be bought at any wholesale chemist's shop. The wood should be placed in a dark and

(Wood)

airtight room, and half a pint or so of ammonia poured into a soap plate, and placed upon the ground in the center of the compartment. This done, shut the entrance, and secure any cracks, if any, by pasted slips of paper. Remember that the ammonia does not touch the oak, but the gas that comes from it acts in a wondrous manner upon the tannic acid in that wood, and browns it so deeply that a shaving or two may actually be taken off without removing the color. The depth of shade will entirely depend upon the quantity of ammonia used and the time the wood is exposed.

*Oil.*—1.—Linseed oil, 4 oz.; vinegar, 2 oz.; mucilage, oil of turpentine, alcohol,  $\frac{1}{4}$  oz. each; butter of antimony,  $\frac{1}{4}$  oz.; hydrochloric acid,  $\frac{1}{2}$  oz.; or linseed oil, 4 fl.oz.; oil of turpentine, 2 oz.; alcohol, 2 oz.; rosin, 1 oz.; rose pink,  $\frac{1}{4}$  oz.

2.—Boiled linseed oil, 1 pt.; yellow wax, 4 oz.; melt, and color with alkanet root.

3.—Acetic acid, 2 dr.; oil of lavender,  $\frac{1}{2}$  dr.; rectified spirit, 1 dr.; linseed oil, 4 oz.

4.—Linseed oil, 1 pt.; alkanet root, 2 oz.; heat, strain and add lac varnish, 1 oz.

5.—Linseed oil, 1 pt.; rectified spirit, 2 oz.; butter of antimony, 4 oz.

6.—Take 1 pt. furniture oil, mix with it  $\frac{1}{2}$  pt. spirits of turpentine and  $\frac{1}{2}$  pt. vinegar; wet a woolen rag with the liquid and rub the wood the way of the grain, then polish with a piece of flannel and soft cloth.

7.—Melt 3 or 4 pieces of sandarac, each of the size of a walnut, add 1 pt. boiled oil, and boil together for one hour. While cooling, add 1 dr. Venice turpentine, and if too thick a little oil of turpentine also. Apply this all over the furniture, and after some hours rub it off; rub the furniture daily, without applying fresh varnish, except about once in two months. Water does not injure this polish, and any stain or scratch may be again covered, which cannot be done with French polish.

8.—Beeswax,  $\frac{1}{2}$  lb.; alkanet root,  $\frac{1}{4}$  oz.; melt until well colored. Then add linseed oil and spirits of turpentine, of each  $\frac{1}{2}$  gill, straining through a piece of coarse muslin.

9.—The wood having been stained, paper off smooth with No. 0 glass paper enough to give an even surface. Add  $\frac{1}{2}$  gill French polish, to  $\frac{1}{4}$  oz. best dragon's blood, well mix and strain through muslin; polish as usual; if wanted very dark, apply a little dragon's blood to the rub-

## Household Formulas

### (Wood)

ber, but the rubber must be covered twice with linen rag.

10. Mix one part of boiled linseed oil with two parts of alcoholic shellac varnish. Shake well before using. Apply in small quantities, with a cloth, and rub the work vigorously until the desired polish is secured.

11. Darkening Furniture. a.—Linseed oil, 1 pt.; rose pink, 1 oz., and alkanet root, 1 oz., beaten up in a metal mortar; let the mixture stand for a day or two; then pour off the oil, which will be found of a rich color. b. Or mix 1 oz. of alkanet root with 4 oz. of shellac varnish, 2 oz. of turpentine, the same quantity of scraped beeswax, and 1 pt. of linseed oil; this should stand a week.

Paste. 1. To keep wood light, scrape  $\frac{1}{4}$  lb. beeswax into  $\frac{1}{2}$  pt. of turpentine. By adding linseed oil the wood is darkened.

2.—Dissolve 6 oz. pearlsh in 1 qt. of hot water, add  $\frac{1}{4}$  lb. of white wax, and simmer for half an hour in a pipkin; take from off the fire, and when cool the wax will float, which should be taken off, and, with a little hot water, worked into a paste.

3. Beeswax, spirits of turpentine and linseed oil, equal parts; melt and cool.

4. Beeswax, 4 oz.; turpentine, 10 oz.; alkanet root to color; melt and strain.

5. Digest 2 dr. of alkanet root in 20 oz. of turpentine till the color is imparted; add yellow wax in shavings, 4 oz.; place on a water bath and stir till the mixture is complete.

6.—Beeswax, 1 lb.; linseed oil, 5 oz.; alkanet root,  $\frac{1}{2}$  oz.; melt, add 5 oz. of turpentine, strain and cool.

7.—Beeswax, 4 oz.; rosin, 1 oz.; oil of turpentine, 2 oz.; Venetian red to color.

8.—White wax, 1 lb.; black rosin, 1 oz.; alkanet root, 1 oz.; linseed oil, 10 oz.

*Polish*.—1.—If the work is full of pores, you should give it a coat of clear size before commencing with the polish, and, when dry, go gently over it with very fine glass paper. The size, by filling up the pores, will prevent both the waste of polish, which would otherwise be absorbed in the wood, and save considerable time in the work. You should place your work in such a situation that the light may shine on it obliquely, so that by looking sideways you may be able to see how the polishing proceeds. Make a wad with a piece of coarse flannel, or drugget, by rolling it round and round, over which, on the side you mean to polish with, put very fine linen rag doubled several times

### (Wood)

to render it as soft as possible; put the wad, or cushion, to the mouth of the bottle containing the polish and shake it, which will damp the rag sufficiently, then proceed to rub your work in a circular direction, observing not to do more than a foot square at a time; rub it lightly till the whole surface is covered, and repeat this operation three or four times, according to the nature of the wood. Be very particular in having your rags clean and soft as the effect of the polish depends, in a great measure, on its being kept clean and free from dust. Rub each coat till the rag appears dry, and be careful not to put too much upon the rag at once, and you will obtain a beautiful and lasting polish.

2. Melt three or four pieces of sandarac, each of the size of a walnut, add 1 pt. of boiled oil, and boil together for one hour. While cooling add 1 dr. of Venice turpentine, and if too thick a little oil of turpentine also. Apply this all over the furniture, and after some hours rub it off; rub the furniture daily, without applying fresh varnish, except about once in two months. Water does not injure this polish, and any stain or scratch may be again covered, which cannot be done with French polish.

3.—The subjoined simple preparation is said to be desirable for cleaning and polishing old furniture. Over a moderate fire put a perfectly clean vessel. Into this drop 2 oz. of white or yellow wax. When melted, add 4 oz. of pure turpentine, then stir until cold, when it is ready for use. The mixture brings out the original color of the wood, adding a luster equal to that of varnish.

4.—Melt 3 or 4 pieces sandarac, each of the size of a walnut, add 1 pt. of boiled oil, and boil together for one hour. While cooling add 1 dr. of Venice turpentine, and if too thick, a little oil of turpentine too. Apply this all over the furniture, and after some hours rub it off; rub the furniture daily, without applying fresh varnish, except about once in two months. Water does not injure this polish and any stain or scratch may be again covered, which cannot be done with French polish. This receipt is very highly recommended for use in the household.

5.—Melt together 4 parts of paraffine, 1 part of tallow and pour the mixture into a vessel containing hot water. Add 12 parts of oil of turpentine and stir well. Allow to stand until cold.

6.—The following is a good polish for furniture, to be used upon new wood for hand polishing, in place of French polish,

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(Wood)

but one that requires constant manual labor, may be made of beeswax and turpentine spirit melted together, with red sanders wood to color it. This has been tried for many years and well repays the trouble attending it. It should not be used upon work that has been French polished, but the following will be found better than most that can be bought for reviving the brilliancy of French polished goods. Take equal parts of turpentine, vinegar, spirits of wine (methylated) and raw linseed oil, and place them in a bottle in the order in which they are mentioned; great care must be taken in this last particular; if not, the mixture will curdle and become useless.—*Smither*.

7.—Derby cream is made by adding 6 oz. linseed oil to 3 oz. acetic acid. This is agitated well, and  $\frac{1}{2}$  oz. butter of antimony and 3 oz. methylated spirit are added.

8.—Soft water, 1 gal.; soap, 4 oz.; beeswax, in shavings, 1 lb. Boil together and add 2 oz. pearlsh. To be diluted with water, laid on with a paint brush, and polished off with a hard brush or cloth.

9.—Wax, 3 oz.; pearlsh, 2 oz.; water, 6 oz. Heat together, and add 4 oz. boiled oil and 5 oz. spirits of turpentine.

10.—The name is sometimes given to a mixture of 1 oz. white or yellow wax with 4 oz. of oil of turpentine.

11.—Rain water, 1 gill; spirits of wine, 1 gill; beeswax, 1 oz.; pale yellow soap, 1 oz. Cut the wax and soap into thin slices, and boil them in the rain water until dissolved. Take off the fire, and occasionally stir till cold. Afterward add 90% alcohol, bottle, and it is ready for use. The above compound should be applied with a piece of flannel, and afterward rubbed with a soft cotton cloth.

Cabinet Work.—1.—For delicate cabinet and papier-mâché work.—Linseed oil, 32 oz.; spirit, 8 oz.; vinegar, 8 oz.; butter of antimony, 2 oz.; oil of turpentine, 8 oz. Shake well before using, and apply with a woollen rubber.

2.—Oil of turpentine, 16 oz.; rectified oil of amber, 16 oz.; olive oil, 16 oz.; oil of lavender, 1 oz.; tincture of alkanet, 4 dr. Mix. A cotton rubber is saturated with this polish, which is thus applied to the wood. The latter is then well rubbed with soft, dry cotton rags and wiped dry.

3.—Carved Cabinet Work.—Dissolve 2 oz. seed lac and 2 oz. white rosin in 1 pt. 90% alcohol. This must be laid on warm, and if the work can be warmed also, it will be so much the better; at any rate, moisture and dampness must be avoided.

(Wood)

Used with a brush for standards or pillars of cabinet work. The carved parts of cabinet work are also polished thus: Varnish the parts with the common wood varnish, and having dressed them off where necessary with emery paper, apply the polish used for the other parts of the work.

4.—Polish for Fine Carved Wood.—Take 8 oz. linseed oil, 8 oz. old ale, the white of an egg, 1 oz. spirit, 1 oz. hydrochloric acid. To be well shaken before using. A little is to be applied to the face of a soft linen pad and lightly rubbed for a minute or two over the article to be restored, which must afterward be polished off with an old silk handkerchief. This will keep any length of time, if well corked.

5.—Chemical Polish.—Linseed oil, 40 parts; alcohol, 4 parts; vinegar, 16 parts; antimony chloride, 2 parts; ammonium chloride, 1 part; spirits of camphor, 1 part. Place the oil in a large bottle, and add successively the antimony chloride, the spirits of camphor, the vinegar and the alcohol, part by part, and with constant shaking; when thoroughly incorporated, add the sal ammoniac.

6.—Copal Polish.—Melt with gentle heat finely powdered gum copal, 4 parts, and gum camphor, 1 part, with ether to form a semi-fluid mass, and then digest with a sufficient quantity of alcohol.

Ebony, to Polish.—1.—Give the work two coats of fine copal varnish and rub this down (when dry) quite smooth with fine pumice stone; put on a third coat of the same and rub down with rotten stone; clean and put on a flowing coat of best spirit copal varnish, and when this has become quite dry, polish with chamolais skin and the palm of the hand.

2.—Add  $\frac{1}{4}$  oz. best drop black to  $\frac{1}{2}$  gill French polish. A little of the drop black may be used on the inside rubber, but covered twice with linen rag.

3.—A high polish on ebony, one that will be durable. Give the work two coats of fine copal varnish and rub this down, when quite dry smooth with fine pumice, put on a third coat of the same and rub down with rotten stone; clean and put on a flowing coat of best spirit copal varnish, and when this has become quite dry, polish with chamolais skin and the palm of the hand.

Eggshell Polish on Wood.—Three parts shellac, 1 part gum mastic and 1 part sandarac gum dissolved together in 40 parts alcohol form a beautiful polish; apply with brush or rag.

French Polishing.—1.—French polish-



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### (Wood)

ing is the name given to the art of coating wood with a fine, smooth, glossy surface or varnish of shellac and various other gums, which are easily soluble in 90% alcohol, methylated spirits, or wood naphtha. A varnish is thus produced, but if it is applied simply with a brush, as copal, mastic, and most other varnishes are applied, the result is a very broken and uneven surface instead of a smooth and continuous polish. To obtain a good polish with a lac varnish on wood it is necessary to apply a very small quantity at once, and to rub it continuously until it dries; when this process has been carefully and properly gone through, the result is a beautiful and even surface, which is not to be surpassed or even equaled by any other means.

2.—French Polish Reviver.—a.—Linseed oil,  $\frac{1}{2}$  pt.; spirits of camphor, 1 oz.; vinegar, 2 oz.; butter of antimony,  $\frac{1}{2}$  oz.; spirit of hartshorn,  $\frac{1}{4}$  oz.

b.—One-half gill vinegar; 1 gill spirits of wine; 1 dr. linseed oil.

c.—Naphtha, 1 lb.; shellac, 4 oz.; oxalic acid,  $\frac{1}{4}$  oz. Let it stand till dissolved; then add 3 oz. linseed oil.

Friction, Polish for Wood.—Used without. Dissolve 4 oz. best shellac in 2 pt. strong alcohol, add 2 pt. linseed oil and 1 pt. spirit of turpentine, shake and add 4 oz. sulphuric ether (common ether) and 4 oz. aqua ammonia. Shake when used and apply with a sponge lightly.

3.—French (Shellac) Polish Combined with Chalk.—These polishes, according to the *Farben Zeitung*, can be readily applied and are very useful for furniture which is not too much scratched; much worn surfaces must first be treated with chalk and afterward with the French polish. Most of the shellac (French) polishes on the market are to some extent colored by the shellac they contain, but in most cases they require to be brightened up with aniline dyes to bring out the desired characteristic color of the wood in polishing. To obtain a better distribution of the polish, some linseed oil or well-refined thin mineral oil is added to the French polish. A polish of this kind, for example, can be prepared by dissolving 5 parts by weight each of shellac and sandarac in 77 parts by weight of 95% alcohol, filtering, and adding 8 parts by weight of mineral oil and 8 of Spanish white; this French polish can be dyed additionally with aniline dyes.

Hard Wood Filler.—Use boiled linseed oil and enough powdered starch to make a very thick paste—add a little japan and reduce to proper consistency with oil

### (Wood)

of turpentine. Add no color for white oak or white ash; for other wood add enough color to cover the white of the starch. For dark ash and chestnut use little raw sienna; for walnut, burnt umber and a very little Venetian red. Apply the filler with brush or rags, let dry for several days, then sandpaper.

Imitation Polish for Woodwork.—The wood is first varnished over with gelatine, and after drying and smoothing, with a mixture of  $2\frac{1}{4}$  lb. fluid copal varnish and 4 dr. pure drying linseed oil; after drying the wood is polished with an ethereal solution of wax.

Piano Polish.—1.—Alcohol, 95%, 300 parts; benzol, 700 parts; gum benzoin, 8 parts; sandarac, 16 parts. Mix and dissolve. Use as French polish.

2.—Another excellent polish for freshening up polished or varnished surfaces is as follows: Beeswax, 2,500 parts; potassium carbonate, 25 parts; oil of turpentine, 4,000 parts; water, rain or distilled, 4,500 parts. Dissolve the potassium carbonate in 1,500 parts of the water and in the solution boil the wax, shaved up, until the latter is partially saponified, replacing the water as it is driven off by evaporation. When this occurs remove from the fire and stir until cold. Now, add little by little and under constant agitation, the turpentine, stirring until a smooth homogeneous emulsion is formed. When this occurs add the remainder of the water under constant stirring. If a color is wanted use alkanet root, letting it macerate in the oil of turpentine before using the latter (about an ounce to the quart is sufficient). This preparation is said by the *Journal of the Austrian Pharmaceutical Association* to be one of the best polishes known. The directions are very simple: First, wash the surface to be polished, rinse and dry. Apply the paste as evenly and thinly as possible over a portion of the surface, then rub off with a soft woolen cloth, using plenty of elbow grease.

3.—Gum mastic, 65 parts; shellac, 250 parts; alcohol (95%), 1,000 parts. For the finest work, the alcoholic solution of the gums should be shaken with about one-tenth of its volume of benzene, and the latter drawn off after the mixture has been allowed to stand for a few hours. This gives greater mobility.

4.—Egg whites,  $1\frac{1}{2}$  oz.; raw linseed oil, 8 oz.; wood alcohol,  $2\frac{1}{2}$  oz.; orchil,  $\frac{1}{2}$  oz.; hydrochloric acid, 2 oz.; vinegar, 8 oz.

Red Polish.—Oil of turpentine, 16 oz.; alkanet, 4 dr.; beeswax, 4 oz. Digest

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(Wood)

the alkanet in the oil until sufficiently colored; then scrape the beeswax fine and form a homogeneous mixture by digestion over a water bath. For a plate polish omit the alkanet.

**Repolishing Furniture.**—1.—Shellac, 4 parts; alcohol, 32 parts; oil of turpentine, 16 parts; linseed oil, boiled, 32 parts; ammonia water, 4 parts. Dissolve the shellac in the alcohol; dissolve in a separate vessel the linseed oil in the turpentine, and mix the two solutions, adding them slowly with continuous agitation; then add the ammonia water and mix by agitation until thoroughly homogeneous.

2.—Mix one part of old boiled linseed oil with 2 parts of an alcoholic solution of shellac. Agitate each time before using, and apply in small quantities, rubbing vigorously until the polish is attained.

3.—White wax, 2,500 parts; water, 4,500 parts; potassium carbonate, 25 parts; oil of turpentine, 4,000 parts. Boil the wax in 1,500 parts of the water, carrying the potassium carbonate, until the wax is emulsified. Add sufficient water to replace that lost by evaporation and stir till cold and add, little by little, under constant agitation, the oil of turpentine, and continue to stir until a complete emulsion is obtained. When this occurs add the remainder (3,000 parts) of the water all at once and stir in. In case the mixture is incomplete add a little more oil of turpentine. To use the cream smear a little of it on a thin soft rag and with this go over the furniture; then polish with a woolen cloth, or bit of flannel. The cream answers equally well for leather upholstery, imitation leather, leather, cloth, marble, etc.

**Polishing by Rubbing.**—1.—Rubbers.—The small rubbers employed for doing carved framework, etc., are usually made of white wadding and the large round ones used for surface work are mostly formed of soft flannel. The latter kind must be firmly made; and the more they possess such qualifications as proper size and solidity, the more quickly and satisfactorily will they polish extensive surfaces.

2.—Rags.—Fine linen makes the best rubber coverings and spiriting cloths, but cheap cotton will answer nearly as well. Both stuffs are preferred after having been used and washed several times. The way to wash them is to boil them first in a strong lye of potash, and then in a weak one of soap powder, suffering each boiling to be succeeded by a thorough rinsing in clean water.

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3.—Wettings.—Some workmen wet the soles of their rubbers by dipping into a saucer containing the preparation, and others by holding their bottles upside down, allowing the polish to shower through the drilled punctures of the stopples. Care should be taken not to soak the rubber too much by either means; and after wetting and covering, the sole ought always to be pressed forcibly upon the palm of the hand so as to equalize the moisture.

4.—Rubblings.—Invariably on beginning with a newly wetted rubber, gently and regularly sweep the surface from end to end in the running direction of the fiber three successive times; then rub across the grain with a semi-circular motion, till the polishing tool becomes dry. This operation is of course repeated until the whole surface of the pores is no longer visible. The work so treated is now to be left in a clean apartment for a period of twelve hours, this being the time required for the complete absorption of the first body. The sinking period expired, the work is smoothed, dusted, etc., and then the polishing of it is recommenced. The first sweepings are similar to those described in the preceding embodying, after which ply the rubber wholly with a rotatory movement, leaning lightly on it at first, and slightly increasing the necessary pressure toward the drying of it, which is finally accomplished by sweeping once or twice along the grain, expressly to remove any marks that may have been caused by the cross or round rubblings. In these manipulations it is much better to use freely extended motions than contracted ones; therefore the mechanical movements of the arm must on no account be confined. Wipe all the dust off your work at each recommencement. Allow every embodying a proper time to absorb and harden, previous to the reapplication of smoothing stuffs or polishes. Cover your rubber with a clean part of the rag at each wetting. Carefully guard against working your implement too long in one direction, and leaning too heavily on it when it is very wet, else you will be apt to produce coarse marks and streaky roughness. Rubber marks may be removed by their being reversely rubbed with a heavily pressed half dry rubber. In polishing a very large surface, such as the top of a dining table, do only one-half at a time. In spiriting, the finishing spirit should not be used in excess, because it dissolves a portion of the resinous or gummy body, and thereby causes dimness instead of brightness. If, how-

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(Wood)

ever, the spirit be slightly and judiciously employed, the desired clearness of luster will make itself apparent. Prior to the application of the spirit cloth, which consists of a few soft rags loosely rolled up in the shape of a large finger rubber and slightly damped with spirit, it is most essential to ply the rubber more quickly, and a little longer than ordinary, for the purpose of removing all signs of moisture and greyness from the surface of the gloss. Most polishers seem to think that nothing can be more productive of transparent brilliancy and durable hardness at the finish than the moderate use of spirit that has been somewhat weakened by exposure to the air, and an allowance of two hours as a resting period between the final embodying and the spiriting.

**Repolishing, Directions for.**—In order to apply this process with facility, you will find it needful to disunite the various parts of each article. If your job be a wardrobe, take off the doors by unfastening their hinges; remove all the screw nails; take off the cornice; lift the wings or carcasses from the base; and then separate the moldings and other carved ornaments from the frames and panels of the doors. If it be a chest of drawers, pull the drawers out; unscrew the knobs or handles; remove the scutcheons from the keyholes; free the columns or pilasters from their recesses, and lift the carcass from off the base. If your job should happen to be a sideboard, separate the upper back from the top, unscrew the under back, and then take the base, top and pedestals asunder. After having disjoined the different portions and ornaments, take a pencil and put tallying marks on every two meeting sides; this will guide you in having everything appropriately replaced, when the complete article is finished. The viscid rust must be thoroughly removed from the surface of the work; this is done by scrubbing it with a paste made of the finest emery flour and spirits of turpentine. After cleansing and before repolishing, it is a good plan to merely moisten the face of the work with raw linseed oil, for this causes the old body to unite with the new one. Where shallow dents, scratches and broken parts of the polish present themselves, carefully coat them two or three times with a thick solution of shellac, and when the last coatings become hard rub them with soft putty until they become uniformly smooth and even; then proceed to polish the general surface.

**Satinwood or Maple.**—One quarter oz. chrome yellow to 1 gill light French pol-

(Wood)

ish; use as before described; a little chrome yellow on the rubber is desirable. In French polishing always use a drop of linseed on the rubber.

**Turner's Work.**—Dissolve 1 oz. sandarac in  $\frac{1}{2}$  pt. 90% alcohol; shave 1 oz. beeswax, and dissolve it in sufficient spirits of turpentine to make it into a paste; add the former mixture to it by degrees; then, with a woolen cloth, apply it to the work while it is in motion in the lathe, and polish it with a soft linen rag; it will appear as if highly varnished.

**Wainscot.**—Take as much beeswax as required, and, placing it in a glazed earthen pan, add as much 90% alcohol as will cover it, and let it dissolve without heat. Add either ingredient as is required, to reduce it to the consistency of butter. When this mixture is well rubbed into the grain of the wood, and cleaned off with clean linen, it gives a good gloss to the work.

**Walking Canes and Other Hard Wood.**—The following process gives the most satisfactory and hardest finished surface. Fill with best clear filler or with shellac; dry by heat; rub down with pumice; then put on three coats of clear spirit copal varnish, hardening each in an oven at a temperature as hot as the wood and gum will safely stand. For extra work, the first two coats may be rubbed down and the last allowed a flowing coat. For colored grounds, alcoholic shellac varnish with any suitable pigment (very finely ground in) can generally be used to advantage.

**Walnut, To Polish.**—1.—To give black walnut a fine polish so as to resemble rich old wood, apply a coat of shellac varnish, and then rub it with a piece of smooth pumice stone until dry. Another coat may be given, and the rubbing repeated. After this, a coat of polish, made of linseed oil, beeswax, and turpentine, may be well rubbed in with a dauber, made of a piece of sponge tightly wrapped in a piece of fine flannel several times folded and moistened with the polish. If the work is not fine enough, it may be smoothed with the finest sandpaper and the rubbing repeated. In the course of time the walnut becomes very dark and rich in color, and in every way is superior to that which has been varnished.

**White Polish.**—1.—White wax, 1 lb.; solution of potash, 32 oz. Boil to proper consistency.

2.—White Polish for Light Woods.—White (bleached) shellac, 3 oz.; white gum benzoin, 1 oz.; gum sandarac,  $\frac{1}{2}$

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### (Wood)

oz.; alcohol or wood naphtha, 1 pt.; dissolve.

**White and Gold.**—1.—Brackets, console tables, whatnots, chairs, and other furniture, are frequently done in white and gold. The grain of the wood should first be filled in with whiting and glue size, one or two coats well papered off and white polished, but the wood should not be finished off with spirits until gilt, leaving the last coat to be done when the gilding is finished; the gilding is done as in 1.

2.—A cheaper mode, and much easier for the amateur: First well clean the article (if not new) with soda and water; when dry, scrape and smooth all over, stop up cracks with white lead and driers, one of driers to two of white lead; mix

### (Wood)

some good white paint made of turps, driers, and white lead, not oil. Give the article three coats, rubbing down the first coat when dry with pumice and water; when the third coat of paint is quite dry, proceed to gild as before described, using either gold leaf or gold paint; when so done, give the gold a coat of transparent enamel varnish, after which varnish the white work with clear copal varnish. Give the work two coats; it will set in a day. Small boxes and other fancy articles may be done by this process.

3.—One pt. linseed oil, 1 oz. alkanet root,  $\frac{1}{4}$  oz. rose pink, boil for  $\frac{1}{4}$  hour, strain through muslin so that the oil may be clear; to use it pour a little oil on flannel; rub briskly. After two or three applications, the effect will be apparent.



## CHAPTER XIV

# ICE CREAMS, CONFECTIONERY AND CHEWING GUM

### CHEWING GUM

The manufacture of chewing gum is by no means the simple operation that it seems upon examination of the formula. Considerable experience in manipulation is necessary to success, and the published formulæ can at best serve as a guide rather than as something to be absolutely and blindly followed. Thus, if the mass is either too hard or soft, change the proportions until it is right. Often you will find that different purchases of the same article will vary in their characteristics when worked up. Some manufacturers add a little paraffine or wax to harden the mass, but the most successful attribute their success to the employment of the most approved machinery and greatest attention to details. The working formulæ and the processes of these manufacturers are guarded as trade secrets.

1.—Chicle,  $3\frac{1}{2}$  lb.; paraffine wax, 1 lb.; tolu balsam, 2 oz.; Peru balsam, 1 oz. Dissolve the gum in as much water as it will take up, melt the paraffine, and mix all together. Now take sugar, finely granulated, 10 lb.; glucose, 4 lb.; water, 3 pt. Put the sugar and glucose into the water, dissolve, and boil them up to "crack" degree (confectioners' term), pour the syrup over the oil slab, and turn into it sufficient of the above gum mixture to make it tough and plastic, adding any of the following flavors, if desired: Cinnamon, chocolate, sandalwood, myrrh, galangal, ginger or cardamom.

2.—Chicle,  $3\frac{3}{4}$  lb.; white wax, 1 lb.; sugar, 10 lb.; glucose, 2 lb.; water, 3 pt.; balsam of Peru, 1 oz.; flavoring, a sufficient quantity.

3.—Tolu balsam, 4 oz.; benzoin, 1 oz.; white wax, 1 oz.; paraffine, 1 oz.; powdered sugar, 1 oz. Melt together, mix well, and roll into sticks.

The following formulæ all yield excellent results:

4.—White wax, 1 part; paraffine, 1 part; balsam of tolu, 4 parts; benzoin,

1 part; powdered sugar, 1 part; flavoring matter, sufficient. Melt the gums, etc., together, and, when fluid, stir in the sugar and flavoring matter (any of the essential oils). When cool enough, roll into sticks or cut into dice.

5.—Yellow wax, 10 parts; balsam of tolu, 2 parts; balsam of Peru, 1 part; American thus, 15 parts; Venice turpentine, 20 parts. Melt together, and add, in fine powder, the following: Cinnamon, 6 parts; chocolate (not sweet), 10 parts; red sandalwood, 2 parts; ginger, 1 part; sugar, 2 parts. Mix well, and pour out on a slab. When cool enough, cut into suitable pieces. This is very fine.

6.—Gum chicle, 50 parts; paraffine, hard, 15 parts; balsam of tolu, 2 parts; balsam of Peru, 2 parts; sugar, granulated fine, 100 parts; glucose, 64 parts; water, a sufficient quantity. Soak the chicle in water until it absorbs all that it will take up. Melt the paraffine and balsams together and add the swelled chicle. In the meantime, mix the sugar and glucose with 50 parts of water, and boil together until a little of the liquid, withdrawn on the end of a stick, and quickly dipped into a glass of cold water, snaps between the fingers on an attempt to bend it (what is called the "crack," or eighth degree of candy boiling, by confectioners). When this is reached quickly remove from the fire and pour out on a large marble slab, the surface of which has been previously greased with butter or good sweet oil. As soon as the syrup is spread add to it, a little at a time, carefully working in, the melted mixture of gums, paraffine, etc., until a portion of the mixture, tested, is found to have the proper degree of toughness. The flavoring (which consists of the essential oils, such as wintergreen, cinnamon, clove, sandalwood, etc., or any other substance that you may desire) should be well incorporated with the paraffine and gum mixture before adding to the syrup. These are the methods of procedure, and read easily enough, but you will find that it

## Ice Creams, Confectionery and Chewing Gum

### (Chewing Gum)

will pay you to employ an expert confectioner to carry them out. Sugar boiling, the carrying it to just the right degree, is an art in itself. You will need a large, smooth slab of marble, several inches thick, on which to do the mixing.

7.—Spruce gum, 20 parts; chicle, 20 parts; sugar, powdered, 60 parts. Melt the gum separately, mix while hot, and immediately add the sugar, a small portion at a time, kneading it thoroughly on a hot slab. When completely incorporated, remove to a cold slab, previously dusted with powdered sugar, roll out at once into sheets, and cut into sticks. Any desired flavor or color may be added to or incorporated with the sugar.

8.—*Mastic, Gum Mastic*.—The resin flowing from the incised bark of *Pistacia lentiscus*, var. *China*. It occurs in pale yellowish, transparent, rounded tears, which soften between the teeth when chewed, and give out a bitter, aromatic taste, sp. gr. 1.07. It is soluble in both rectified spirit and oil of turpentine, forming varnishes. It is chiefly used as a masticatory to strengthen and preserve the teeth and perfume the breath.

9.—Take of balsam tolu, 4 oz.; white resin, 16 oz.; sheep suet,  $1\frac{1}{2}$  oz., more or less, and melt together. Of above mixture take 2 oz.; white sugar, 1 oz.; oatmeal, 3 oz. Soften and mix on a water bath. Roll the pieces in finely powdered sugar or flour to form sticks, etc., as desired. Paraffine, with a little olive oil and glycerine, may be melted together for a chewing gum. The exact mixture will vary with the season, etc.

10.—Chicle, 1 lb.; sugar, 2 lb.; glucose, 1 lb.; caramel butter, 1 lb. First mash and soften the gum at a gentle heat. Now place the sugar and glucose in a small copper pan, add enough water to dissolve the sugar, set on a fire, and cook to  $241^{\circ}$ ; lift off the fire, add the caramel butter and lastly the gum; mix well into a smooth paste; roll out on a smooth marble, dusting with finely powdered sugar, run through a sizing machine the thickness you desire, cut into strips, and again into thin slices.

11.—Gum chicle, 122 parts; paraffine, 42 parts; balsam of tolu, 4 parts; sugar, 384 parts; water, 48 parts. Dissolve the sugar in the water by the aid of heat, and pour the mass on an oiled slab. Melt the gum, balsam and paraffine together and pour on top of the syrup, and work the whole together. The presence of paraffine in chewing gum is objected to on the ground that in case the gum is swallowed the paraffine will not digest, but

### (Confectionery)

may form an obstruction in the alimentary canal. It may be omitted from this combination.

12.—Tolu balsam, 4 lb.; resin, 10 lb.; paraffine, 3 lb.; sugar, fine powder, enough. Melt together the first three ingredients, strain, and incorporate enough sugar to make a mass.

13.—To make a cheap chewing gum the confectioners boil to a weak "crack" 20 lb. of sugar, 6 lb. of glucose and 2 qt. of water. This they throw on a slab, and spread over it 2 lb. of melted white wax and a stiff paste made by mixing up with flour 4 oz. of gelatine steeped in water. When sufficiently cool, all is mixed together and a few drops of spirit of lemon added. The above comes out cheap, and has many other advantages; it can be put through the machine, pulled, or otherwise cut up into squares, made into sticks, etc.

14.—Venice turpentine, 100 parts; American tins, 75 parts; yellow wax, 50 parts; balsam tolu, 10 parts; balsam Peru, 5 parts. Melt together and add, in fine powder: Cinnamon (Chinese), 30 parts; chocolate, 50 parts; red sandalwood, 10 parts; myrrh, 5 parts; galangal, 5 parts; ginger, 5 parts; cardamom,  $2\frac{1}{2}$  parts. Mix, and roll out, when cool enough, into sticks, or make into any suitable form.

### CONFECTIONERY

*Rose Almonds*.—Put into a round-bottomed copper basin, which has been thoroughly cleaned and warmed, 1 lb. of Jordan almonds; whether they be blanched, or unblanched, is not important. Now have ready 6 lb. of syrup or white sugar boiled to the "blow" degree, and still hot, and while your helper stirs the almonds constantly with a wooden spatula pour the hot syrup slowly, and in a small, fine stream, over them. This mode of operation causes the sugar to granulate upon the surface of the almonds and coat them, and you are to continue it until this coating becomes thick enough to please you.

*Burnt Almonds*.—Free 1,000 parts of selected sweet almond kernels from dust by tossing and rubbing them on a sieve, then place them in a pot or pan, and heat them over a free fire, with constant stirring, until they are uniformly hot throughout. In the meantime, put into a suitable boiler: Sugar, 1,000 parts; glucose, 100 parts; water, 150 parts; boil together to the "bon-bon" consistency, and add: Cinnamon, 20 parts; red bole, 25 parts; cloves,  $7\frac{1}{2}$  parts; vanilla sugar, 25 parts; and stir well in. Now pour the

## Ice Creams, Confectionery and Chewing Gum

### (Confectionery)

hot almonds into the syrup thus made, and let boil a moment, or until the almonds begin to pop, stirring vigorously all the while. Have ready a shallow copper pan, lightly oiled, and at this moment lift the almonds out, by aid of a broad copper dipper, and spread them carefully out in the pan. Let cool, and after the almonds are cold separate the masses.

*Coltsfoot Rock Candy.* Purified extract of licorice, 1 lb.; water, q. s.; tragacanth, 2 oz.; sugar, 28 lb.; spirit of lemon, 1 fl.oz.; extract of poppies, 2 fl.oz.; Spanish brown, q. s. Dissolve the licorice in 12 fl.oz. of water, and swell the tragacanth in 20 fl.oz. of water. Mix these, and add the other ingredients, using a sufficient quantity of Spanish brown to color the candy. Make into a paste. By means of a piston and screw, force through a metal tube having star-shaped holes at the bottom. Cut into lengths and dry.

*Fruit, To Crystallize.*—The following process may meet the requirements: Make a syrup from 1 lb. of sugar and  $\frac{1}{2}$  pt. of water; stir until the sugar is dissolved, then boil quickly about 3 or 4 minutes. Try by dipping a little in cold water. If it forms a small ball when rolled between the thumb and finger it has attained the desired degree, known as the ball. Throw the fruit to be conserved, a little at a time, into this syrup, let it simmer for a moment, lift with a skimmer, draining free from all syrup. Sprinkle sugar thickly over the boards or tin pans, place the fruit over it in a single layer, sprinkle over thickly with granulated sugar, and place in the oven or sun to dry. When dry, make a syrup as before, and just before it reaches the ball degree add the fruit, stir with a wooden spoon until it begins to grain and sticks to the fruit. When cold, sift off the sugar and put out again to dry. When dry, place in boxes, in layers, between sheets of waxed paper. Keep in a cool, dry place.

*Gumdrops.*—Grind 25 lb. of Arabian or Senegal gum, place it in a copper pan or in a steam-jacket kettle, and pour 3 gal. of boiling water over it; stir it up well. Now set the pan with the gum into another pan containing boiling water, and stir the gum slowly until dissolved; then strain it through a No. 40 sieve. Cook 19 lb. of sugar with sufficient water, 2 lb. of glucose and 1 teaspoonful of cream of tartar to a stiff ball, pour it over the gum, mix well, set the pan on the kettle with the hot water, and let it steam for  $1\frac{1}{2}$  hours, taking care that the water

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in the kettle does not run dry; then open the door of the stove and cover the fire with ashes, and let the gum settle for nearly 1 hour; then remove the scum which has settled on top, flavor, and run out with the funnel dropper into the starch impressions, and place the trays in the drying room for 2 days, or until dry; then take the drops out of the starch, clean them off well, and place them in crystal pans, 1 or 2 layers. Cook sugar and water to 341 $\frac{1}{2}$ " on the syrup gauge and pour over the drops lukewarm. Let stand in a moderately warm place overnight, then drain the syrup off, and about an hour afterward knock the gumdrops out on a clean table, pick them apart, and place on trays until dry.

*Italian Cream Caramels.* Place 8 lb. of sugar, 2 lb. of brown sugar into a copper pan; add 3 lb. of glucose and 2 qt. of cream or of the richest milk; set on the fire and stir until dissolved. When boiling, cover a minute or two to steam down the grain; remove the lid, and stir, with the thermometer in it, and cook to 235°; remove from fire, and mix 2 lb. of macaroon cocoanuts, 2 lb. of cream, fondant and 3 lb. more of glucose in the batch; set a moment on the fire, and pour out on the marble, either greased or papered, and between iron bars. As soon as it has formed a little crust, mark with a long knife or with a caramel cutter, and when cool, but still warm, glaze with white shellac. When cold, break apart and wrap, or pack in paper boxes.

*Lime Tablets.*—"A" sugar, 20 lb.; glucose, 5 lb.; citric or tartaric acid, 5 oz. Put the sugar in a clean copper kettle, pour 5 pt. of water over it, stir well, and set over a brisk fire. When the sugar is boiling cover it with a wooden lid, so as to steam down all the grain which may adhere to the side of the pan; let boil for a while, lift off the lid, add the glucose, and cook to 230° F. After the starch is done, pour on a greased marble slab, fold in the edges, and sieve the acid over the top of the sugar; then sprinkle some lime juice or oil of lime over it, and sufficient green vegetable color to give it a bright tint. Fold the batch together, and work it with your hands to thoroughly mix the flavor, color and acid, but do not handle more than necessary, as the sugar should be kept as clear as possible. Lay the mass near the batch-warmer, cut off small pieces, and run them through the tablet rollers. After they are cold, sift off and put away in tin cans or glass jars. Other fruit tablets are made in the same



## Ice Creams, Confectionery and Chewing Gum

### (Ice Creams)

manner, only changing color and flavor to correspond with name.

**Maple Caramels.**—Maple sugar, 10 lb.; cream of tartar, 1 even teaspoonful; water, 1 qt.; rich cream, 1 qt.; cook to crack. Put 10 lb. of maple sugar in a copper kettle and add 1 even teaspoonful of cream of tartar; now add 1 qt. of water, set the kettle on a quick fire, and stir till the sugar is dissolved; then cook to a hard boil; then add 1 qt. of rich cream, and cook the batch to a crack; then pour out on an oiled slab, between iron bars, in a mass  $\frac{5}{8}$  in. thick, and when almost cold mark in small squares with a hoarhound cutter; and when cold place in tin trays.

**Ice Cream Cones.**—Here is the formula for 1,000 cones: Granulated sugar, 10 lb.; pastry flour, 20 lb.; fresh eggs, 5 doz.; extract of vanilla, to flavor; water (orange-flower water, if desired), enough. The iron on which the cones are baked has something to do with the baking of the cone; in fact, it has as much to do with the production of a good article as the batter itself.

### ICE CREAMS

#### Bases.

**Corn Starch.**—Pure milk, 2 gal.; sugar, 2 lb.; corn starch,  $\frac{3}{4}$  lb.; flavoring, as desired. Dissolve the starch in 1 qt. of the milk by the aid of heat; mix all together; continue to heat until slightly thickened, then flavor and freeze.

**Cream.**—Pure cream, 2 gal.; sugar, 2 lb.; flavoring, as desired. Mix well, and freeze.

**Eggs.**—a.—Milk, 2 gal.; sugar, 4 lb.; flour, 4 oz.; eggs, 12; common salt, 1 dr.; flavoring, as desired. Mix the flour, sugar and salt with 1 qt. of the milk, add the eggs, which should be well beaten, and the flavoring; heat the milk to boiling, mix all together, boil for a few minutes, let cool, strain, and freeze.

b.—Fresh milk, 2 gal.; granulated sugar, 2 lb.; eggs, 36; flavoring, as desired. Beat the eggs thoroughly and add the sugar, stirring up well together; put the milk on the fire, and stir all the time until it boils; pour the milk into the sugar and egg mixture, stirring all the time; set on the fire, and stir for a few minutes until slightly thickened; strain and cool, flavor and freeze.

c.—Milk, 1 gal.; sugar, 4 lb.; eggs, 4; rich cream, 6 qt.; flavoring, as desired. Bring the milk to boiling, add the sugar, stirring all the time, and then set aside to cool. Beat thoroughly the whites and yolks of the eggs separately, add the

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cream and the flavor, mix with the sweetened milk, and freeze as usual.

d.—Milk, 3 pt.; eggs, 5 or 6, beaten separately; sugar, 3 cupfuls. Heat the milk to near boiling point, add the sugar, and stir well. Beat together the whites and yolks of the eggs, after they have been beaten separately. Pour the hot milk in this, little by little, beating briskly all the time. Then return to the fire and let it remain 15 minutes, or until as thick as custard. When quite cold add 1 pt. of rich cream, and flavor with vanilla or lemon.

e.—Cream, 1 pt.; eggs, 4; sugar, 2 scant cupfuls; vanilla, lemon, or any other flavor desired,  $2\frac{1}{2}$  teaspoonfuls. Make a custard of the milk, eggs and sugar; when cold, add the cream and flavoring; then freeze.

**Gelatine.**—Cream, 2 gal.; milk, 2 qt.; condensed milk, 1 pt.; sugar, 4 lb.; gelatine, 1 oz.; flavoring, as desired. Soak the gelatine in water for 2 or 3 hours, dissolve in the milk by the aid of heat, add the other ingredients, stir well, and freeze.

**Unflavored Ice Cream.**—Many dispensers use an unflavored ice cream, relying on the syrup in the soda for the taste, as it were. The following recipe should be used: Sweet cream, 4 qt.; granulated sugar, 4 lb.; sweet milk, 2 qt. First dissolve the sugar in the milk and cream, then strain into 12-qt. freezer.

#### Coloring.

Coloring matters which are harmless can be prepared as follows:

1.—**Green.**—Chlorophyll is the best coloring matter to use. By mixing tincture of saffron or turmeric with a solution of indigo carmine—readily made from paste—in various proportions, a variety of green shades can be obtained.

2.—**Red.**—Cochineal syrup and solution of carmine have been used for many years, and are very satisfactory. Cochineal syrup is prepared as follows: Powdered cochineal, 12 parts; potassium bicarbonate, 4 parts; distilled water, 30 parts; alcohol, 24 parts; simple syrup, 120 parts. Rub up the potassium bicarbonate with the cochineal powder, mix the alcohol and water, and add to the powder. Filter, and mix the solution with the syrup thoroughly. The solution of carmine is made as follows: Carmine, 22 parts; stronger water of ammonia, q. s.; distilled water, q. s. to make 500 parts. Dissolve the carmine in the ammonia water and add the water.

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3.—*Yellow*.—Tincture or infusion of saffron, tincture of turmeric.

#### Flavoring.

*Chocolate Paste*.—Liquor chocolate, 5 lb.; glucose,  $\frac{1}{2}$  lb.; sugar, 4 lb. Put the liquor chocolate in a pan; place the pan in hot water and let it remain until the chocolate is melted; then put the sugar and glucose in a copper pan, adding enough water to dissolve the sugar; then cook to a syrup ( $35^{\circ}$  on a syrup gauge), and while the syrup is hot pour it in a small stream into the melted chocolate, stirring the latter while adding the syrup. Keep up this stirring until the chocolate becomes a smooth paste; then set it away in an earthen vessel for use. In flavoring, put 1 lb. of the paste into a pan and warm it till melted by putting the pan in hot water; then add a little plain cream to it, mixing it well, and afterward adding the chocolate to the cream to be flavored.

*Fruit Juices*.—Fruit juices are not to be added in the preparatory cooking of the cream; they should be mixed with the sugar, and stirred in with it until a clear syrup is obtained. This syrup may

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be stirred into the cream just before the freezing, or it may be beaten into it after the cream is frozen. The latter method is the better of the two.

#### Making and Freezing Ice Cream.

A mistaken practice that is followed by many workmen is to transfer a finished batch from the machine can to a stack can, strain in the fresh batch, and use the same ice for a second run. It is a wrong thing to do, for the strength of the ice and salt is gone; it has done its work. At the end of each run remove the can from the machine, wet the sides and bottom, and slide the contents into a packing can; every spoonful of cream will come out readily, and your machine can be ready for another run. To utilize the ice that is left in the tub, dump it into the break box, then throw it on to the can just transferred, and put on another shovelful of salt. Your cream will become nice and firm, and will keep until next day if you need to carry it over. This practice saves time and money, and is the only sure and economical way to manufacture good ice cream.

Table of Proportions of Materials in Making Ice Cream  
Compiled by E. F. White, from the *Spatula*

	Pints of fruit juice.	Pints of base cream.	Juice of lemon.	Remarks.
Apricot .....	2	9	1	
Blackberry .....	2	9	1	
Black cherry .....	2	9		
Black Currant .....	2	9		1 oz. of lime juice.
Black raspberry .....	2	9		
Champagne .....	2	10		
Chocolate .....		10		6 oz. of chocolate, 2 oz. of vanilla sugar.
Claret .....	2	9		4 oz. of orange wine.
Cranberry .....	2	9	1	4 oz. of orange wine.
Currant .....	$1\frac{1}{2}$	9	1	
Damson .....	2	9	1	4 oz. of orange wine.
Ginger wine .....	2	9		
Gooseberry .....	2	9	1	
Greengage .....	2	9	1	
Huckleberry .....	2	9	1	4 oz. of orange wine.
Lemon wine .....	2	10	1	
Lime juice .....		9		4 oz. of lemon wine, 1 oz. of lime juice.
Madeira .....	2	9		
Peach .....	2	10	1	
Pear .....	2	9	1	
Pineapple .....	$1\frac{1}{2}$	8	1	$\frac{1}{2}$ pt. orange wine or juice of 3 oranges.
Plum .....	$1\frac{1}{2}$	9	1	$\frac{1}{2}$ pt. black cherry juice.
Pomegranate .....	2	9	1	2 oz. of vanilla sugar.
Quince .....	$1\frac{1}{2}$	10	1	8 oz. of orange wine, 2 dr. of essence of cinnamon, 2 dr. of essence of cloves.
Raspberry .....	$1\frac{1}{2}$	10	1	8 oz. orange wine, 1 dr. essence of rose.
Strawberry .....	2	10	1	

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### (Ice Creams)

#### Ice Creams.

*Almond or Orgcat Ice Cream.*—Cream, 1 qt.; sweet almonds, 8 oz.; bitter almonds, 2 oz.; sugar, 12 oz.; orange-flower water, 2 oz. Blanch the almonds, and pound quite fine in a mortar, using the orange-flower water to prevent their oiling; rub through a sieve and pound again the portion which has not passed through until fine enough; mix with the cream, and make into a custard with the yolks of 7 eggs; strain, and, when cold, freeze.

*Banana.*—Usually, the bananas are cooked in a little milk, with sugar, then pressed through a sieve; add to them the yolks of 2 or 3 eggs, according to the amount of bananas used, after which add the cream and milk in equal quantities, and then freeze. Some finely chopped pistachio nuts add to the flavor.

*Bisque.*—To make 40 qt. of bisque ice cream: Dissolve 10 lb. of sugar in 20 qt. of cream, strain into the freezing can and start to freeze. After the cream is nearly frozen mix in  $1\frac{1}{2}$  lb. of bisque crumbs and 1 qt. of sherry—or half sherry and half Jamaica rum—and finish up. This will sell as well as any mixed flavor that is made. Bisque crumbs are made from two-thirds stale macaroons and one-third stale sponge cake. These are toasted to a dark brown in the oven, and, when cold, crushed with a rolling pin and passed through a coarse sieve. This makes fine bisque crumbs, and the only kind that should be used. Bisque cases may be purchased of any reliable baker.

*Burnt Almond.*—1.—Roast 1 lb. of almonds to a nice yellow. Then put 2 lb. of sugar in a copper kettle, set on the fire, and stir slowly all the time until the sugar becomes liquid and of a golden color; then add the almonds; give it a few turns, and pour it on the greased marble, and, when cold, pulverize the same in a mortar; then place this in the boiler with 4 qt. of cream. Proceed in the usual manner, adding the yolks of 8 eggs.

2.—Put over the fire  $\frac{1}{4}$  lb. of raw almonds and  $\frac{1}{4}$  lb. of sugar until the sugar has taken on a delicious brown. Turn the batch, put on a greased slab, and let it cool; then pound in a mortar. Put it into 3 qt. of cream, add  $1\frac{1}{2}$  lb. of flour and some vanilla flavoring. Cook as for other cream, then strain and freeze. Also same as *Filbert* (2).

*Burnt Ice Cream.*—To 1 qt. of custard for ice put into a stewpan 4 oz. of powdered sugar; place by the side of the stove or over the fire, to melt and burn a fine brown, stirring constantly; when

the proper color mix the custard quickly with it; when cold, freeze.

*Cherry.*—1.—Red cherries, 3 lb., picked, pounded, boiled with  $\frac{1}{2}$  pt. of water, and rubbed through a hair sieve; syrup, 1 qt.; cochineal, to color. A few drops of essence, cherry kernels.

2.—Cherries, 2 lb.; cream, 1 qt.; sugar or syrup, 12 oz. Pound the cherries, with the stones, in a mortar, adding a few ripe gooseberries or currants; pass the pulp through a sieve, add the cream and sugar, juice of 2 lemons and a little cochineal; mix, and freeze. From preserved fruit it is made the same way, adding a little noyau, or a few bitter almonds, pounded, for the flavor of the kernel.

*Chocolate.*—1.—Place 1 pt. of milk, 7 heaping tablespoonfuls of sugar and 4 squares of bakers' chocolate in a double boiler, and cook until the chocolate has melted and the mixture is smooth. Chill, turn into the freezer, and turn the dasher until the mixture is frozen to the consistency of mash. Take out the dasher, add 1 pt. of whipped cream and a small tablespoonful of vanilla. Beat vigorously, repack, and stand for 2 hours to mellow.

2.—Powdered chocolate, 20 oz.; powdered or granulated sugar, 1 lb.; pulverized cinnamon, 1 oz. Rub up well in a mortar, and add 1 qt. of cold water and 1 oz. of vanilla extract (best). Add this paste to 2 gal. of cream, being careful to remove all lumps. Now add 3 gal. of rich milk, and mix all well, and add  $1\frac{1}{2}$  or 2 oz. of extract of pepsin. Freeze, and serve.

*Coffee.*—1.—Cream, 4 qt.; sugar, 1 lb., 12 oz.; yolks of 8 eggs; good ground coffee, 3 oz. (or the equivalent of extract). Place the sugar, half of the cream and coffee in the pan, over a slow fire, and keep stirring until it has reached the boiling point; then mix up the egg yolks with the remainder of the cream and pour it in, and bring it to the point of boiling. Strain through a fine sieve or cloth, then cool off and freeze.

2.—Ground coffee, 1 tablespoonful; milk,  $\frac{1}{4}$  cupful; heavy cream,  $\frac{1}{4}$  cupful; sugar, 1 tablespoonful; a grain of salt. Add the coffee to the milk, cook over hot water for 5 minutes, then strain; add remaining ingredients, strain through cheese cloth, and freeze.

*Debauchee.* This is a rich cream, allowing 8 egg yolks to 1 qt. of sweet cream, and 1 vanilla bean to every 2 qt., and if properly made it should be frozen in a French freezer, or at least after the French style. This cream, like all others

## Ice Creams, Confectionery and Chewing Gum

### (Ice Creams)

of this sort, is especially adaptable for molding.

**Filbert.**—1.—Cream, 1 qt.; nuts, 1 lb.; sugar, 12 oz., or 1 pt. of syrup. Break the nuts and roast the kernels in the oven; pound with a little cream; make a custard, and finish as almond ice.

2.—**Burnt.**—Same proportions. Put the kernels into the syrup, boil until they crack; stir the sugar with a spatula, that it may grain and adhere to the nuts; when cold, pound with the sugar quite fine; make a custard, and mix with it, allowing for the sugar that is used for the nuts; mix, and freeze as the others.

**Fruit Ice Cream.**—Milk, 1 generous pt.; sugar, 2 cupfuls; flour, 1 small tablespoonful; eggs, 2; gelatine, 2 tablespoonfuls, soaked in a little water; cream, 1 qt.; bananas, 4; candied cherries,  $\frac{1}{2}$  lb., and other fruit if desired. Let the milk come to a boil, beat the flour, sugar and eggs together, and stir in boiling milk. Cool 20 minutes, then add the gelatine. When cold, add the cream. Put in the freezer, freeze 10 minutes, add the fruit, and finish freezing.

**Grape.**—Sweet cream, 2 pt.; granulated sugar, 12 oz.; grape juice, 1 pt. Boil one-half the cream in a double boiler; add the sugar, and stir until dissolved. When cool, add the grape juice and the rest of the cream, and freeze.

**Hazelnut.**—Hazelnuts, 5 oz., roasted to a light brown color, then the skins removed. This is best done by rubbing them in a towel, then put in a sieve, and the skin is easily shaken off. Pound them in a stone mortar, with some milk, to a fine pulp. Next put 4 qt. of cream, with 1 lb. 12 oz. of sugar, into a boiler, over the fire, and before it has reached the degree of boiling add 12 egg yolks, beaten up with some of the cream. The hazelnuts should be added to the cream at the outset, thus increasing the flavor. Pass through a fine sieve, and when cold freeze in the usual manner.

**Lemon.**—1.—To make 20 qt.: Grate the rinds of 12 good, sound lemons on 1 lb. of sugar. (Do not grate deeply, or your cream will be bitter.) Rub the gratings well into the sugar, then add the juice of the lemons. To 10 qt. of cream add 5 lb. of sugar, and strain into the machine can; then strain in the lemon, and freeze. This cream will make up very fine, but must be watched closely, as it will butter easily.

2.—Six large lemons; cream, 1 qt.; sugar, 12 oz., or  $\frac{1}{2}$  pt. of syrup. Grate the peels of 3 lemons into a basin, squeeze

### (Ice Creams)

the juice to it, let stand for 2 or 3 hours, strain, add the cream and syrup, and freeze, or mix as orange.

**Macaroon.**—Set the macaroons in the oven to dry before trying to grate them. Sift before using. Have ready a frozen vanilla ice cream; into it stir the macaroons, pack into a mold, and set deeply into a pail filled with ice and salt. There let it remain for 2 hours at least; 3 or 4 would be better.

**Maple.**—Make a custard of 3 pt. of milk, 1 cupful of sugar and the well beaten yolks of 5 eggs. Moisten  $\frac{1}{2}$  lb. of maple sugar and boil until it candies. Stir into the custard, and when cool, and ready to freeze, add 1 pt. of whipped cream and the beaten whites of the eggs.

**Melon.**—Scrape out the soft center of a cantaloupe, press through a colander, and add to it milk and cream in equal quantities, with the sugar that seems necessary. In serving, the obviously proper receptacle will be the rinds of the melons.

**Millie Fruit Ice Cream.**—Flavor a lemon cream ice with elder flowers, mix in some preserved dried fruits and peels cut in small pieces. Before it is moulded sprinkle with prepared cochineal, and mix a little, that it may appear marbled.

**Nut Frappé.**—Nut frappé, 1 qt.; maple fudge, 1 qt.; extract of vanilla, 1 oz.; cream, 5 gal.; powdered sugar, 1 lb.; caramel to color light brown. Freeze in usual way.

**Orange.**—1.—To 4 qt. of cream 2 large oranges and 1 lemon are required, with the addition of 2 lb. of sugar. Secure the orange flavor by rubbing off the rind on lump sugar. In default of hard sugar, grate off the yellow skin on a grater. Be careful not to rub off the white pith beneath the surface. Using sugar, you will have the essential oil embedded in it, producing a flavor in all its purity and strength, and this, mixed in turn with the juice, will give a rich flavor for either confection, beverage or cream.

2.—Six Seville oranges; lemons, 3; cream, 1 qt.; sugar or syrup, 12 oz. Rub the yellow rind of 2 or 3 oranges on part of the sugar, scrape off with a knife; squeeze out the juice of the oranges and lemons and strain; mix with the cream and the sugar on which the rind has been rubbed; add the other part of the sugar, dissolve, and freeze.

3.—Eight China oranges; lemons, 2; cream, 1 qt.; sugar, 12 oz. Rub the rind of 4 or 5 of the oranges and 1 lemon on sugar, squeeze, strain the juice; add the cream, mix, and freeze.

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### (Ice Creams)

*Peach.*—1.—To make 40 qt.: Pare and stone  $\frac{1}{2}$  peck of ripe peaches; mash them with as much sugar as you would use to sweeten them for table use. To 20 qt. of cream add 10 lb. of sugar and a drop of red color—just enough to give the cream a clean yellowish look. Without a little color the cream will look dark and unappetizing. Strain the cream in the freezing can, pour in the peaches, and freeze.

2.—Cream, 2 qt.; sugar, 1 lb.; enough good, ripe peaches, mashed and passed through a sieve, to make 1 pt. of juice, mixed with a little syrup or fine sugar. This is all stirred together and frozen at once. All fruits which contain acid, being of a tart nature, cannot be left standing after being incorporated with the cream; therefore, it is advisable to add the juice when the batch is nearly frozen. A little pink coloring is preferred by some ice cream makers; this, of course, is only a matter of taste.

*Philadelphia Ice Cream.*—Cook 8 lb. of sugar in 2 gal. of cream; bring it to a boil, when it should resemble skim milk; add, and work in, an additional 3 gal. of cream, 6 eggs and 2 oz. of vanilla. It is now ready for freezing.

*Pineapple.*—Pineapple juice, 8 oz.; lemon juice,  $\frac{1}{2}$  oz.; sugar, 8 oz.; cream, 2 pt. Heat the cream and part of the sugar in a farina boiler until dissolved, add to it the solution prepared from the balance of the ingredients, then freeze.

*Pistachio.* Cream, 1 qt.; pistachios, 8 oz.; sugar, 12 oz. Blanch and pound the pistachios, with a little of the cream; mix, and finish as orgeat, flavoring with essence of cedrat or the rind of a fresh citron rubbed on sugar; or the custard may be flavored by boiling in it a little cinnamon and mace and the rind of a lemon; color with spinach.

*Strawberry.*—1.—Crushed strawberries,  $\frac{1}{2}$  gal.; concentrated strawberry syrup,  $1\frac{1}{2}$  pt.; pure cream, 10 gal.; granulated sugar, 5 lb. For strawberry color, use a little red fruit coloring. For fine trade a little more fruit can be added. Put color in as the cream starts to thicken or freeze.

2.—Have 2 qt. of berries, hulled and perfectly clean; mash, and press through a sieve; then sweeten with powdered loaf sugar; add 3 pt. of milk and 1 qt. of cream; color with a bit of carmine.

*Vanilla.*—1.—Boil 1 lb. of sugar with 2 qt. of milk, and add it to 1 lb. of sugar, 10 eggs and 10 yolks already prepared by whisking up together. Mix all these well together and boil until the mixture thick-

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ens a little. Remove from the fire and add 3 qt. of cream, which thoroughly incorporate by whisking. Add vanilla flavoring just before finishing. Strain, and freeze in the usual way.

2.—Cream, 2 qt.; sugar,  $1\frac{1}{2}$  lb.; yolks of 1 doz. eggs; whites of 2 eggs; vanilla bean or stick, a sufficient quantity, say  $\frac{1}{2}$  bean, grated very fine; lemon peel, a small piece. The liquid flavoring may be used, but the product is not as fine as the Delmonico, made by using the bean.

3.—Cream, 3 pt.; milk, 1 pt.; sugar, 12 oz.; extract of vanilla, 4 dr. Dissolve the sugar in the cream and milk; strain, and freeze. When nearly finished add the extract of vanilla.

4.—Cream, 10 qt.; milk, 5 qt.; condensed milk, 5 qt.; sugar, 10 lb.; gelatine, 4 oz.; extract of vanilla, 5 oz.; hot water, 1 pt. Make a solution of the gelatine in the water.

### WATER-ICES, SHERBETS AND FROZEN FRUITS

*Ambrosie Sherbet.*—Take sugar syrup, 1 qt.; strawberry juice, 1 qt.; juice of 4 oranges and 2 lemons; mix well, add a little champagne wine, and freeze. Now add enough of the champagne to make 1 qt. in all, freeze a little more, then add a small liquor-glassful of good old kirsch and the same quantity of maraschino di zara. When serving, place a small ripe strawberry on top of each glass, either sugared first, or macerated in the maraschino.

*Apple-Ice.*—Pare and core some fine apples, cut in pieces into a preserving pan, with sufficient water for them to float, and boil until reduced to a marmalade; strain, and to 1 pt. of apple-water add  $\frac{1}{2}$  pt. of syrup, juice of 1 lemon and a little water; when cold, freeze.

*Apricot (Fresh Fruit).*—1.—Fine, ripe apricots, 24; cream, 1 qt.; sugar, 12 oz.; the juice of 2 lemons, with a few of the kernels, blanched; mash the apricots, rub through a sieve, mix, and freeze.

2.—From Jam.—Jam, 12 oz.; cream, 1 qt.; the juice of 2 lemons; sugar, 8 oz.; a few kernels or bitter almonds, blanched and pounded fine; rub the whole through a sieve, and freeze.

*Apricot-Ice.*—Fine, ripe apricots, 18 or 20; syrup,  $\frac{1}{2}$  pt.; water,  $\frac{1}{2}$  pt.; juice of 2 lemons. Mash the apricots, pass through a sieve, mix the pulp with the syrup, water and lemon juice, break the stones, blanch the kernels, pound fine, with a little water, pass through a sieve, add to the mixture, and freeze.

*Apricot Sherbet.*—Ripe apricots, 3 qt.;

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water, 3 qt.; icing sugar, 8 lb.; citric-acid solution, 1 oz. Press the apricots through a colander and add the other ingredients; it is now ready to freeze.

**Cherry-Ice.**—Cherries, 2 lb.; cherry kernels, 1 doz.; sugar, 2 lb.; water, 1 qt.; lemon juice, 1 oz. Seed the cherries and add them to the kernels, bruised in a stoneware mortar; mash together; add the sugar and water, stirring until all the sugar is dissolved; strain the mixture, and freeze.

**Current-Ice.**—To make 16 qt.: Mash 4 qt. of bright red currants with 1 lb. of sugar, squeeze in the juice of 8 lemons; add 8 qt. of clear water and a drop of red color; strain and freeze.

**Custard for Ices.**—Cream, 1 qt.; eggs, 6; powdered loaf sugar, 12 oz. Break the eggs into a stewpan, and whisk together; add the cream and sugar; when well mixed, place on the fire, and continue stirring from the bottom with the whisk, to prevent burning, until it gets thick; take from the fire, continue to stir for a few minutes, and pass through a sieve. If the custard be suffered to boil it will curdle.

**Fruit-Ices.**—1.—With fruit-ices it is much the same as with creams. A boiled fruit will not have as fine aroma and strength of flavor as the fruit used in its natural state. The sugar, fully dissolved in the water and juice, will make the ice as smooth, and have a better flavor, providing enough sugar is used—less than 1 lb. to the quart. This will require a heavier salting for the making and keeping.

2.—Take crushed cherries,  $\frac{1}{2}$  gal.; crushed pineapple, 1 pt.; crushed strawberries, 1 pt.; sliced pineapple (chopped), 1 can; sliced bananas,  $\frac{1}{2}$  doz.; chopped nuts, 1 lb.; maraschino cherries, cut in two,  $\frac{1}{2}$  bottle; syrup, 1 gal.; then add 1 oz. of solution of citric acid, and water enough to make 3 gal. Freeze, pack, and let stand. Then serve with a little whipped cream and a cherry on top.

**Fruit Pudding, Frozen.**—French cherries, 4 oz.; candied lemon, orange peel, 4 oz., also citron and currants. Saturate them well with rum. Next prepare the following custard: Raw cream, 2 qt.; yolks of 8 eggs; sugar, 12 oz. Make it after the manner of French ice cream. When frozen, incorporate the fruit, and let stand for 1 hour. Then fill into melon molds, sprinkle with picked and washed currants, and pack in ice until wanted. Serve with rum sauce.

**Ginger.**—Preserved ginger, 6 oz.; cream, 1 qt.; syrup from the ginger,  $\frac{1}{2}$

## (Water Ices)

pt.; sugar, sufficient to sweeten; juice of 2 lemons. Pound the ginger in a mortar, add the cream, and freeze.

**Grape-Ice.**—Sugar, 2 lb.; 2 lemons; 1 orange; red Tokay grapes, 2 qt.; water, 1 qt. Put the grapes, sugar and water in a kettle, and place over a slow fire, under constant stirring bring it to a boil, then pass it through a sieve, leaving skin and pits behind. Squeeze the lemons and orange, and add the juice. When cold, freeze in the usual manner. If this is to be served in glasses, beat up quite stiff the whites of 4 eggs and mix into the batch, smooth and foamy. A few drops of red color should be added to give it a more positive appearance, and 2 or 3 whole grapes placed on each portion.

**Grape-Juice Sherbet.**—Sweeten 1 qt. of grape juice to taste, add  $\frac{1}{2}$  lb. of sugar to the juice of 6 oranges, stir till sugar dissolves, mix together, and freeze slowly. Beat the white of an egg, adding 1 tablespoonful of powdered sugar, and stir into the sherbet; repack, and set aside for 2 hours. Serve in sherbet cups.

**Lemon-Ice.**—1.—Water, 4 qt.; lemons, 10; sugar, 4  $\frac{1}{2}$  lb. Grate half the lemons as described in the foregoing formulas, squeeze out, and put rind, juice, half the water, and the sugar into a pan, set it on fire, and stir until the sugar is dissolved and it becomes quite warm. Then remove, and add the remaining 2 qt. of water, and strain into the freezer. If it is not tart enough, add a solution of citric acid to suit your taste; then freeze in the usual manner. Some makers add a few egg whites before freezing, or when half frozen. This is not recommended, as it makes the ice too light, and the consequence is that the ice will become icy and rough after standing any length of time.

2.—Lemon juice,  $\frac{1}{2}$  pt.; water,  $\frac{1}{2}$  pt.; syrup, 1 pt.; peels of 4 lemons, rubbed on sugar (or the yellow rind, pared or grated off, and the juice squeezed to it in a basin); let remain for an hour or two, strain, mix, and freeze. Whip the whites of 3 eggs to a strong froth, with a little sugar, as for meringues; when the ice is beginning to set, work well in; freeze to required consistency. If to be served in glasses, the meringue may be added after it has been frozen.

**Liqueur Cream Ice.**—Flavor with the different liqueurs from which each is named. Put 1 qt. of cream into the ice pot with 6 oz. of sugar, which place in the ice; work well about the sides with a whisk for about 5 minutes; add a glassful of liqueur, work together; whisk the

## Ice Creams, Confectionery and Chewing Gum

### (Water Ices)

whites of 2 eggs to a strong froth, add 2 oz. of sugar, mix well with the cream, and freeze to the required consistency.

*Liquor-Ice.*—Lemon ice, using less water, and making up the deficiency with liqueur. If the taste of the lemon prevails too much, add more water and syrup to correct.

*Nesacrolde Pudding.*—Blanched Spanish chestnuts,  $\frac{3}{4}$  lb.; yolks of 6 eggs; milk,  $1\frac{1}{2}$  pt.; sugar,  $\frac{1}{2}$  lb.; cream,  $\frac{1}{2}$  pt.; maraschino,  $\frac{1}{2}$  gill; mixed glace,  $\frac{1}{2}$  lb., or candied peels, citron sultanas, pineapple, angelica and cherries. Scald and well clean the chestnuts, boil them in the milk until tender, then pulp them. Whisk the yolks and sugar, add them to the nuts and milk, and cook the mixture until it thickens. When cold, flavor with vanilla, and freeze in the usual manner. Meanwhile, pour the maraschino over the fruits, which must be cut in small pieces, and let them stand on ice for a time. Beat up the cream and add it to the partly frozen custard; freeze very dry, beating all well up with the spatula. Stir in the prepared fruits, let it stand a few minutes in the freezer, then mold. A sauce, made as follows, is usually served with this pudding: Whisk or beat well together  $\frac{1}{2}$  pt. of good cream, 2 tablespoonfuls of sugar and 1 gill of maraschino. It may be garnished with molded dessert-ices and cut angelica leaves.

*Noyau Cream-Ice.*—Custard cream, and flavor with noyau; finish as almond-ice.

*Orange Ice.*—1.—China orange juice, 1 pt.; syrup, 1 pt.; water,  $\frac{1}{2}$  pt.; juice of 4 large lemons. Rub the yellow rind of 4 oranges and 2 lemons on sugar, scrape off, and mix with the strained juice, syrup and water.

2.—Orange juice, 2 pt.; juice of 2 lemons; orange-flower water,  $\frac{1}{2}$  dr.; syrup, 2 pt.; water, 6 pt.; beaten white of 1 egg. Mix well, and freeze hard.

3.—Orange juice, 1 qt.; lemon juice, 1 oz.; grated rind of 1 orange; syrup (35°), 1 qt.; water, 4 oz. Heat the syrup and mix with the other ingredients; let the mixture stand in a well covered receptacle for an hour, then freeze.

*Oranges, Frozen.*—Cut oranges, 2 lb.; sugar, 2 lb.; juice of 2 lemons; water, 1 qt. Choose a thin-skinned orange, grate some on a lump of sugar, and cut enough of the flesh into small pieces, or cut each quarter in half, and pick out the seeds. Mix all the ingredients together, and when the sugar is dissolved, freeze. It is not necessary, however, to freeze them extra, for every water-ice can be used for

### (Water Ices)

frozen fruits; all that is necessary is to mix some chopped fruits into the ice, while berries can be added whole.

*Peach.*—The white or flesh-colored freestone are the best for ices. They are of good flavor, and do not contain so much acid as different other varieties. They have to be worked up as quickly as possible, as the flavor of peaches is very delicate, and exposure to the air, if only for a short time, will not only discolor the pulp, but will also destroy the best part of the flavor. When used for cream, the peach should be pared and dropped into the cream; but for water-ice the fruit needs only to be brushed, mashed, strained, and mixed with the necessary amount of sugar, to which may be added a few peach kernels to heighten the flavor.

*Peach-Ice.*—1.—Syrup, 2 qt.; peach pulp, 2 qt.; peach kernels, 4 or 5; lemon juice, 1 oz.; water, enough. Use white-fleshed peaches; wash them, with the kernels; add the syrup, lemon juice, and enough water to bring the mixture to 18 or 20° on the syrup gauge; strain and freeze.

2.—Pulp of ripe peaches, 1 lb.; syrup,  $\frac{1}{2}$  pt.; water,  $\frac{1}{2}$  pt.; juice of 2 lemons. Mix as apricot. If the fruit is not ripe enough to pulp, open, and take out the stones, put in a stewpan with the syrup and water, boil until tender, and pass through a sieve; mix in the pounded kernels; when cold, freeze.

*Pear Water-Ice.*—As apple.

*Pineapple.*—1.—Fresh Fruit. — Fresh pineapple, 1 lb.; syrup,  $\frac{1}{2}$  pt., in which a pine has been preserved; 2 or 3 slices of pineapple cut in small dice; juice of 3 lemons. Pound or grate the pineapple, pass through a sieve, mix with 1 qt. of cream, and freeze.

2.—Preserved Fruit.—Preserved pineapple, 8 oz.; cream, 1 qt.; juice of 3 lemons; pine syrup, sufficient to sweeten. Pound the preserved pine, mix the lemons with the cream, and freeze.

*Pineapple, Frozen.*—Two pineapples, grated; water, 2 qt.; sugar, 2 lb.; beaten whites of 2 eggs. Freeze same as ice cream.

*Pineapple Sherbet.*—Sugar, 9 lb.; water, 10 qt.; juice of 1 doz. lemons; grated pineapple, 4 cans, or four fresh pineapples. Pour the boiling water over the sugar, add the lemon juice and the grated pineapples, or else use only the juice of the pineapples, if desired; stir it well; when cold, add the whites of 12 eggs, mix well, and freeze. The addition of eggs makes the sherbet lighter and more frothy.

## Ice Creams, Confectionery and Chewing Gum

### (Water Ices)

**Pineapple Water-Ice.**—1.—Pine syrup,  $\frac{1}{2}$  pt.; water, 1 pt.; juice of 2 lemons; 3 or 4 slices of preserved pine, cut into small dice; mix, and freeze.

2.—Fresh.—Pineapple, 1 lb.; syrup, 1 pt.; water,  $\frac{1}{2}$  pt.; juice of 2 lemons. Cut the pine in pieces, put into a stewpan with the syrup and water, and boil until tender; pass through a sieve, add the lemon juice, with 2 or 3 slices of the pine cut in small dice, mix, and, when cold, freeze.

3.—Pineapple juice,  $2\frac{1}{2}$  pt.; juice of 2 lemons; syrup, 3 pt.; water, 4 pt.

**Punch-Ice.**—Make a good lemon-ice, or use some orange juice with the lemons, in the proportion of 1 orange to 2 lemons; either rub off the yellow rind of the lemons on sugar, or pare it very thin and soak it in the spirit for a few hours; when the ice is beginning to set work in the whites of 3 eggs to each qt., beaten to a strong froth, and mixed with sugar, as for meringue, or add the whites without whisking. When nearly frozen, take the pot from the ice, and mix well with it some rum and brandy (the prevailing flavor distinguishes it as rum punch or brandy punch-ice); after the spirit is well mixed replace the pot and finish freezing. Champagne, arrack or tea may be added.

**Raspberry.**—1.—Fresh Fruit.—Raspberries, 1 qt.; cream, 1 qt.; sugar,  $\frac{3}{4}$  to 1 lb.; a few ripe currants and gooseberries, or cherries, may be added, instead of all raspberries, and the juice of 2 lemons. Mash the fruit, pass through a sieve to take out the skins and seeds, mix with the other articles, add a little prepared cochineal to lighten the color, put it in the pot, and freeze. All ices made with red fruit require this addition of cochineal.

2.—Jam.—Jam, 1 lb.; cream, 1 qt.; sugar or syrup, about 6 oz.; juice of 2 lemons. Mix as before.

**Raspberry, Frozen.**—Raspberries, 2 lb.; sugar, 2 lb.; water, 1 qt. Mix the berries and sugar, stir lightly once or twice until the sugar is dissolved, add the water, and freeze, beating only enough to congeal it. Color. If in any case the sugar does not dissolve entirely, add enough water, or, better still, juice of the same fruit, to accomplish it, and no more.

**Raspberry Ice.**—Raspberry juice,  $\frac{1}{2}$  pt.; lemon juice,  $\frac{1}{2}$  pt.; syrup, 3 pt.; water,  $3\frac{1}{2}$  pt.; cochineal coloring, caramel, of each a sufficient quantity to color.

**Raspberry Sherbet.**—One quart of berries, mashed. Sprinkle over these 1 pt.

### (Water Ices)

of sugar, add the juice of 1 lemon, and  $\frac{1}{2}$  pt. of water in which has been dissolved 1 teaspoonful of gelatine. Freeze as you would ice cream.

**Ratafia Cream.**—Cream, 1 qt., as for brown bread; ratafia cakes, crumbled quite fine, 6 or 8 oz. Mix with the cream when frozen.

**Roman Punch-Ice.**—Make 1 qt. of lemon-ice, and flavor with rum, brandy, champagne and maraschino; when frozen, to each qt. take the whites of 3 eggs, and whip to a very strong froth; boil  $\frac{1}{2}$  lb. of sugar to the ball, and rub it with a spoon or spatula against the sides to grain it; when it turns white, mix quickly with the white of egg, stir lightly together, and serve in glasses; less sugar must be used in the ice, so as to allow for that which is used in making the meringue.

**Strawberry.**—As raspberry.

**Strawberry, Frozen.**—Make a strawberry water-ice, and, when frozen, add the smallest ripe, whole strawberries; freeze a little longer, repack with ice and salt, and let stand to harden.

**Strawberry Ice.**—1.—Strawberry juice,  $2\frac{1}{2}$  pt.; syrup,  $2\frac{1}{2}$  pt.; water, 3 pt.; juice of 1 lemon; cochineal coloring, a sufficient quantity to color.

2.—Best scarlet pines, 2 bottles; syrup, 1 pt.; water,  $\frac{1}{2}$  pt.; juice of 2 lemons. Mix as currant. All red fruits require a little prepared cochineal to lighten the color.

**Swiss Pudding.**—Take  $1\frac{1}{2}$  pt. of cream and  $\frac{1}{2}$  pt. of milk, and make into a custard with yolks of 7 eggs; flavor with curacao, maraschino or rum; freeze the custard, and add about  $\frac{1}{4}$  lb. of dried cherries, orange, lemon and citron peel and currants; mix in the iced custard. The curacao or rum may be poured over the fruit when you commence freezing, or before. Prepare the mold, which is melon-shaped, opening in the center with a hinge. Strew over the inside with clean currants, fill and close; immerse in some fresh ice mixed with salt. Before turning out prepare a dish as follows: Make a little custard, and flavor with brandy; dissolve some isinglass in water or milk, and when nearly cold add sufficient to the custard to set it; pour into the dish you intend to serve on. As soon as set, turn the pudding on it and serve.

**Tea-Ice.**—Cream, 1 qt.; best green tea, 2 oz.; sugar, 12 oz. Put the tea into a cup, pour on a little cold river water in which has been dissolved a portion of carbonate of soda (about as much as may be placed on a 10-cent piece), let re-



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(Water Ices)	(Water Ices)
<p>main for an hour or two, add boiling water sufficient to make a very strong infusion, or cold water in proportion, letting it soak longer, when a superior infusion will be obtained; strain, and add to the cream and eggs. Finish as the others.</p> <p><i>Tutti Frutti Ice</i>.—Simple syrup, 1 pt.; water, 1 pt.; kirschwasser, 1 gill; pure vanilla extract, 1 teaspoonful; the juice</p>	<p>of 2 lemons; mixed fruits, cut in small pieces, 1 pt. Mix the syrup, water, liquor, vanilla and lemon juice, and freeze the mixture; then mix into it a meringue mass, made of the whites of 2 eggs and 2 oz. of powdered sugar, freeze again, and then add the fruit; mix them lightly, but thoroughly well in; the ice may then be molded and buried in ice and salt till needed for use.</p>

## CHAPTER XV

# INSECTICIDES AND EXTERMINATION OF VERMIN —DOMESTIC, AGRICULTURAL AND HORTICULTURAL

Many formulas for insecticides have been published at considerable length for the use of agriculturists. As these formulas would not interest the average reader they are omitted, but can be readily obtained by consulting the Scientific American Supplement, Nos. 963, 1124, 1594 and 1595, which have valuable articles on Agricultural Insecticides and methods of application. These papers describe the following insecticides: Arsenate of lead, arseniate of lime, white arsenic, arsenic branmash, London purple, Paris green, Scheele's green, white hellebore, fish oil soap, kerosene emulsion, kerosene milk emulsion, lime, lime-salt, sulphur wash, lye and washing soda, sulphur, tobacco, whale oil, carbon bisulphate, hydrocyanic acid gas, spraying, etc.

### Animals, Protectives of, from Insects.

- 1.—Bay oil, 500.0; naphthalin, 100.0; camphor, 60.0; animal oil, 25.0.
- 2.—Bay oil, pressed, 400.0; naphthalin, 100.0; crude carbolic acid, 10.0.
- 3.—Lard, 450.0; ceresin, 300.0; bay oil, 800.0; camphor, 80.0; naphthalin, 80.0; rosemary oil, 25.0.

### Ants.

- 1.—To drive ants out of the room and keep them out use insect powder, ground mustard, sulphur, camphor, tobacco, cloves, oil of cedar, kerosene, persistence.
- 2.—Peru balsam smeared on table legs or the feet of a cupboard keeps ants off furniture. 1 oz. of the balsam boiled in 1 gal. of water and used as a wash has a similar effect.
- 3.—To poison ants, feed them on borax and sugar, or yeast cake and sugar.
- 4.—To kill the insects by wholesale, drop some quicklime on the mouth of their nests and wash it in boiling water.
- 5.—Pour into their retreats water in which camphor or tobacco has been steeped.

6.—Grease a plate with lard and set it where the ants can readily get at it. They will gather by the plateful. The plate may be held over an open fire, when lard and ants will quickly disappear. Repeat until the ants are exterminated.

7.—Saturate a piece of cotton with chloroform and stuff into the entrance of their burrows and seal the entrance so as to keep the fumes inside. This must be done when the ants are at home.

8.—Saturate a sponge with sweetened water and when the ants have gathered, plunge the sponge into boiling water.

9.—A spray of benzine from an atomizer is sudden death to most insects. Benzine is so dangerous, on account of fire, that its use is not recommended except in the hands of careful and experienced people; perhaps carbon tetrachloride would answer as well.

10.—Powdered borax sprinkled around the infested places will exterminate both red ants and black ants. Powdered cloves is said to drive them away.

11.—*Laurus*.—The use of carbon disulphide is recommended to destroy ants' nests on lawns. A little of the disulphide is poured into the openings of the hill or disk, stepping on each as it is treated to close it up. The volatile vapors of the disulphide will penetrate the chambers of the nest in every direction, and if sufficient has been used will kill, not only the adult insects, but the larvae as well. A single treatment is generally sufficient.

12.—*Trees, To Prevent Ants from Injuring*.—Make a line of gas tar round the stem of the tree, or if it be trained on a wall, make a horizontal line near the ground on the wall, and one around the stem; this will prevent ants from ascending.

### Aphides, and Similar Plant Parasites.

Spray the plant with a very weak solution of alum—1½ to 2%. This solution

Always consult the index when using this book.

## Insecticides and Extermination of Vermin

### (Bites of Insects)

is said not to be harmful to even tender plants, but fatal to parasites.

#### Bedbugs.

1.—Rub the joints of the bedstead with equal parts spirits of turpentine and kerosene oil, and where there are many, the cracks in the surface of the room. Filling up all the cracks with hard soap is a good remedy.

2.—Take everything out of the infested room, plug up all the windows tightly, close all chimneys, and empty about 1 oz. of powdered sulphur on a pan of hot coals, placed in the middle of the floor. Shut the doors and cover all the cracks; let the sulphur burn as long as it will. Where the room is large, it is a good plan to fasten a bit of tin tube to the bottom of the pan, and to this connect enough small rubber pipe to lead out of the pipe with the bellows, the sulphur will be caused to burn more quickly by the draught created, and to give a denser smoke. After the sulphur has burned out, paint all the cracks in the floor and around the mop board with a strong solution of corrosive sublimate, and treat the furniture to the same before replacing it. We have seen a room frightfully infested completely freed by this plan.

3.—Corrosive sublimate, 1 oz.; muriatic acid, 2 oz.; water, 4 oz.; dissolve, then add turpentine, 1 pt.; decoction of tobacco, 1 pt. Mix. For the decoction of tobacco boil 2 oz. of tobacco in 1 pt. of water. The mixture must be applied with a paint brush. This wash is a deadly poison.

4.—Mix together: camphor, 2 oz.; spirits of turpentine, 4 oz.; corrosive sublimate, 1 oz.; alcohol, 1 pt.

5.—Strong mercurial ointment, 1 oz.; soft soap, 1 oz.; oil of turpentine, 1 pt.

6.—Benzine, gasoline or coal oil will kill these pests as fast as they can be reached. By using a spring bottom oiler the fluid can be forced into all the cracks and crevices. As the fluid is inflammable, contact with fire must be avoided. The room should be well aired.

#### Beetles, To Exterminate.

1.—Red lead, sugar and flour, equal parts; mix; sprinkle near the holes.

2.—Powdered borax, 20 parts; precipitated carbonate of baryta, 10 parts. The precipitated carbonate of baryta should be used, and not the native witherite.

#### Bites of Insects.

*Protection Against Insects.*—1.—Yellow wax, 85.0; spermaceti, 60.0; sweet

### (Buffalo Moths)

oil, 500.0. Melt and add: Boiling distilled water, 150.0. After cooling add: Clove oil, 2.0; thyme oil, 3.0; eucalyptus oil, 4.5.

2.—Bay oil, pressed, 100.0; acetic ether, 12.0; clove oil, 4.0; eucalyptus oil, 3.0.

3.—Yellow wax, 75.0; bay oil, 160.0; thyme oil, 8.0; eucalyptus oil, 8.0.

4.—White vaseline, 120.0; patchouli oil, 4.0; valerian oil, 3.0.

5.—Alcohol, 130.0; thymol, 10.0; eucalyptus oil, 5.0; marjoram oil, 3.0.

*Remedies for Insect Bites.*—1.—Carbolic acid, 15 gr.; glycerine, 2 dr.; rose water, 4 oz.

2.—Salicylic acid, 15 gr.; collodion, 2½ dr.; spirit of ammonia, 5½ dr.

3.—Fld. ext. *Rhus toxicodendron*, 1 dr.; water, 8 oz.

4.—Ipecac, in powder, 1 dr.; alcohol, 1 oz.; ether, 1 oz.

5.—One of the very best applications for the bites of mosquitoes and fleas, also for other eruptions attended with intense itchings, is: Menthol in alcohol, 1 part to 10. This is very cooling and immediately effectual. It is an excellent lotion for application to the forehead and temples in headachg, often at once subduing the same.

6.—Ammonia water, 5 dr.; collodion, 6 dr.; salicylic acid, 3 gr. Mix and apply.

#### Buffalo Moths.

It may be well to explain as a preliminary that the insect commonly spoken of as the "buffalo moth" is not really a moth but a beetle or carpet bug, a name quite appropriate, as it has been known to effect sad havoc among floor coverings.

1.—Common salt sprinkled freely on the floor underneath the edges of the carpet reduced the ravages of the bug materially.

2.—Benzene, kerosene and insect powder are also credited with being efficient in the destruction of the grub. Regarding the latter there may be room for doubt. When using benzene, its highly inflammable character should always be borne in mind. It should be applied only in the entire absence of fire or light, as the vapor formed by its evaporation readily ignites at long distances from its source.

3.—The best protection for woollen garments which are out of use is to thoroughly dust them and then enclose in paper, the joints of the parcel being accurately sealed so as to prevent the incursion of any insect pest. The inclusion of camphor or naphthaline is an additional safe-

## Insecticides and Extermination of Vermin

### (Dogs)

guard in keeping away some kinds, perhaps all; but if eggs remain undisturbed when the fabric is put away, there is no evidence that we are aware of that they will not hatch.

#### Caterpillars, To Destroy.

1.—There are no fewer than 19 insect enemies of the grape, and of these, 7 or 8 assume the caterpillar form at some stage of their development. If the fruit has not been formed, they may as a general thing be destroyed by sprinkling the vines with a solution of Paris green or London purple with water, say a heaping teaspoonful of the former to 2 gal. of the latter. The vines may be dusted with a mixture of the poisons and plaster or flour, in the proportion of 1 to 100. After the fruit has formed, a kerosene soap emulsion sprinkled on the vines would be destructive to the pests without endangering human life. Take about 4 lb. of common yellow bar soap, 1 gal. of kerosene, and 1 gal. of water; heat the mass over the stove, stirring it till it forms a homogeneous, thick yellowish liquid, then remove the mixture from the stove and continue the stirring until it becomes cool. This should be largely diluted with warm soft water, and it will be permanent.

2.—Spraying with a decoction of tobacco, or with 2% carbolic acid water.

3.—Or with 0.5% solution of copperas.

4.—Or cautious dusting with burnt lime.

5.—Venice turpentine, 200 parts; rosin, 1,000 parts; turpentine, 140 parts; tar, 80 parts; lard, 500 parts; rape oil, 240 parts; tallow, 200 parts.

6.—Rosin, 50 parts; lard, 40 parts; stearine oil, 40 parts.

7.—Rosin, 3 parts; rape oil, 4 parts; lard, 2 parts; soft soap, 1 part; wood tar, 10 parts.

8.—Rosin, 36 parts; rape oil, 36 parts; Venice turpentine, 20 parts; wood tar, 5 parts; turpentine, 3 parts. Paint the mixture while warm on strips of paper smoothly on the tree trunk about a yard above the ground. This should be done at the end of October or the beginning of November, to prevent the females of the winter moth from climbing tree.

#### Dogs.

1.—A soap for washing dogs and other animals is sometimes made by mixing Stockholm tar (wood tar) with melted soap. The tar should first be dissolved in pyroxylic spirit (wood naphtha).

2.—Petroleum, 5 grams; wax, 4 grams;

### (Flies in Houses)

alcohol, 5 c.c.; good laundry soap, 15 grams. Heat the petroleum, wax and alcohol in a water bath until they are well mixed, and dissolve in the mixture the soap cut in fine shavings. This may be used on man or beast for driving away vermin.

3.—Soft soap, 2 oz.; creolin,  $1\frac{1}{2}$  oz.; alcohol, 10 oz.; water, 20 oz. Dissolve the soap and creolin in the alcohol, and add the water gradually.

#### Fleas, Lice, Ticks, etc., on Domestic Animals.

For fleas on a dog or cat, place the animal in a box without a top, and rub a good insect powder plentifully into its hair. The fleas will drop off, and if a little straw is in the bottom of the box to hold them, they may be burned with it. The powder must be of good quality and the application should be made on a clear, dry day.

1.—Oil of pennyroyal, or a decoction of the herb, applied to animals is said to drive fleas off.

2.—It is also said that the insects will not remain where chamomile flowers are.

3.—Insect powder well sprinkled about a room will tend to discourage the pests.

4.—Clove oil, 4 dr.; Cologne water, 5 oz.; alcohol, 7 oz. Mix and filter.

#### Flies, House.

*Essences for Spraying.*—1.—Eucalyptol, 10 parts; bergamot oil, 3 parts; acetic ether, 10 parts; Cologne water, 50 parts; alcohol, 9%, 100 parts. Mix. 1 part of this "essence" is to be added to 10 parts of water and sprayed around the rooms frequently.

*Fly Papers.*—Fly papers are of two kinds. One is a non-poisonous variety to which the flies adhere once they have alighted upon it. By their struggles to get free, the flies then smear themselves all over with the sticky compound, and getting their spiracles stopped up, perish of suffocation. The other kind contains a poison, generally arsenic, which is made palatable by means of sugar in some form, and which the flies, in imbibing the sugar, take into their stomachs with fatal results. Of course, sweet substances are added to the sticky fly papers to attract the insects.

Liquids. Non-poisonous.—1.—Quassia chips, 20 parts; molasses, 3 parts; alcohol, 1 part; water, 115 parts. Macerate the quassia in 100 parts of water for 24 hours, boil for half an hour, set aside for 24 hours, then press out the liquid. Mix this with the molasses and evaporate to

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### (Flies in Houses)

4 parts. Add the alcohol and the remaining 15 parts of water, add without filtering, saturate absorbent paper with it. This being set out on a plate with a little water attracts the flies, which are killed by partaking of the liquid.

2.—Infusion quassia, 1 pint; brown sugar, 4 oz.; ground pepper, 2 oz. Mix well and place in small shallow dishes.

3.—Ground pepper, 1 dr.; brown sugar, 1 dr.; milk or cream, 2 fl. dr. As above.

4.—Cobalt Fly Paper.—Vomacka gives the following: Quassia chips, 150 parts; chloride of cobalt, 10 parts; tartar emetic, 2 parts; tincture of long pepper (1 to 4 of good spirit), 80 parts; water, 400 parts.

5.—Quassia, 40 parts; colocynth, 5 parts; piper longum, 8 parts, boiled with water to 120 parts filtrate, adding 10 parts of syrup; the paper is saturated with this and to prevent souring it is dried as quickly as possible.

**Liquids. Poisonous.**—These are prepared by saturating absorbent paper with poisonous solutions.

1.—Honey, 12 oz.; orpiment, 1 oz. Sugar may be used in place of the honey if a powder is desired.

2.—Make a solution of 2 parts arseniate of potassium or arseniate of sodium, 4 parts white sugar, 40 parts water. Saturate stout unsized paper in this solution, then dry. To use the paper, moisten it with water, and place in saucers. Great care should be taken with this paper, as it is poisonous.

3.—As strong a solution of white arsenic as can be made in sweetened water.

4.—A mixture of molasses, honey, or moist sugar, with about 1-12 of its weight of King's yellow or orpiment.

5.—Boil 2 oz. of small quassia chips in 1 gal. of water for 10 minutes. Strain and sweeten with 2 lb. of molasses. Venice turpentine may also be added.

6.—Mix together: Black pepper, 1 oz.; brown sugar, 2 oz.; cream, 4 oz.

7.—Dissolve 2 oz. of arsenic or potash or soda and 4 oz. of sugar in a quart of water.

**Fumigating Paper.**—Apply to bibulous paper a strong ethereal or alcoholic solution of benzoin, tolu, storax, olibanum or labdanum. To burn well the paper should first be impregnated with an aqueous solution of saltpeter and dried.

**Powders.**—1. Powdered long pepper, 5 parts; powdered quassia, 5 parts, powdered sugar, 10 parts; alcohol, 68%, 4 parts. Mix the powders, moisten with the alcohol, dry, and powder again. Keep well stoppered. For use, a little is placed

### (Gophers and Ants)

in a saucer and set where the flies are most abundant.

2.—Eucalyptol, 1 part; powdered orris root, 4 parts; powdered starch, 15 parts. Dispense in sprinkle-top tin boxes.

3.—Eucalyptol, 5 parts; chalk, 10 parts; starch, 85 parts. Mix. To use, cover the hands, head and other exposed parts. The flies will not come near them.

**Skin Applications.**—Hagar says mixtures like the following are to be applied to the skin: Pure oil tar, 1 oz.; olive oil, 1 oz.; oil of pennyroyal, ½ oz.; spirit of camphor, ½ oz.; glycerine, ½ oz.; carbolic acid, 2 dr.

### Flies, Gnats, etc., To Keep from Stock.

1.—The best protection for animals, says the *Pharmaceutische Zeitung*, Berlin, against flies, gnats, gadflies, and even hornets, is eucalyptus oil, but on account of its dearness it is generally mixed with laurel oil. The following has proven highly effective: To eucalyptus water add enough creolin to cause a milky turbulence, and with this wet the parts of the body exposed to attack, using a sponge as a vehicle. Be careful not to get too much creolin, as this has a tendency to make the hair rough and unsightly.

2.—a.—As a sure protection against gadflies, the following is recommended: Laurel oil, 1,000 parts; acetic ether, 200 parts; naphthalene, 200 parts; clove oil, 20 parts. Mix.

b.—Animal oil, 100 parts; alcohol, 200 parts; acetic acid, 5,000 parts. Mix.

### Flower Pots, Worms in.

Corrosive sublimate, 2 oz.; ammonium chloride, 4 oz.; boiling water, 1 pt. When cold add this solution to 2 gal. cold water.

### Fungous Diseases of Trees.

Copper carbonate, 1 oz.; ammonia, enough to dissolve the copper; water, 9 gal. The copper carbonate is best dissolved in large bottles, where it will keep indefinitely, and it should be diluted with water as required. Copper sulphate, 1 lb.; water, 15 gal. Dissolve the copper sulphate in the water, when it is ready for use. *This should never be applied to foliage, but must be used before the buds break.* For peaches and nectarines use 25 gallons of water.

### Gophers and Ants, To Exterminate.

Add ½ oz. of strychnine to 1 pt. of hot vinegar—more if the vinegar is of poor grade—and after the strychnine has all dissolved, mix the vinegar solution with three quarts of water. In this solution soak 10 lbs. of wheat for eighteen or

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### (Lice)

twenty hours, by which time the solution will be entirely absorbed by the grain. Then spread the wheat in the sun to dry. Frequent and vigorous stirring is necessary while the wheat is soaking, in order that the grain may be uniformly saturated with the poison. If properly prepared according to this formula, each kernel of grain will contain a fatal dose of one gopher.

Next dissolve 3 lbs. of sugar in 1 gal. of water and boil down to  $\frac{1}{2}$  gal. This gives a good, thick syrup. When cold, stir in one teaspoonful of oil of anise. When the poisoned wheat is dry, or nearly so, the syrup is poured over it and thoroughly stirred until each grain of wheat is more or less covered with a coating of the syrup. It is then thoroughly dried. A few grains,  $\frac{1}{4}$  to  $\frac{1}{2}$  teaspoonful, are buried near each burrow. A word of caution, however, is necessary. Wheat so poisoned is a dangerous preparation and should be kept out of the reach of fowls and animals. It should be labeled poison and put in some place where there is no possible danger of its being used for any other purpose than that for which it is intended. When using, it is advisable to bury it to prevent the destruction of useful birds.

### Insecticides, House.

*Liquid*.—1. Paraffine, 10 parts; benzine, 70 parts; balsam of copiba, 5 parts.

2. Carbolic acid, 5 parts; ether, 50 parts; benzine, 150 parts.

3. Naphthalin, 12 oz.; benzine, 2 gal. Any of these mixtures may be tinted with aniline dye or alkanet root.

4. Concentrated vinegar, 6 parts; oil of cloves, 2 parts; oleo-balsamic mixture, 25 parts; rectified spirit, 100 parts.

5. Tartaric acid, 5 parts; cologne water, 20 parts; alcohol, 20 parts.

*Powder, Insect*.—1. Insect powder, 8 oz.; borax, 8 oz.; oil of pennyroyal, 2 dr.

2. Insect powder, 8 oz.; borax, 8 oz.; sulphur, 4 oz.; oil eucalyptus, 2 dr. This formula is especially good for cock-  
roaches.

3. Insect powder, 14 oz.; quassia, 6 oz.; white hellebore, 2 oz.

### Lice on Human Beings.

1. Borax,  $\frac{3}{4}$  oz.; glycerine, 1 oz.; decoction of quassia (1 in 5), 15 oz. Apply once daily.

2. Naphthalin, 4 dr.; white wax,  $1\frac{1}{2}$  dr.; olive oil, 6 dr.; petrolatum, 6 dr.; oil of bergamot, 10 min.; oil of cloves, 10 min.; oil of cassia, 10 min.

### (Mice)

#### Lice on Plants.

*Plant Lice*.—1. Green soap, 5 parts; tobacco extract, 5 parts; tincture of quassia, 80 parts; ordinary alcohol, 30 parts; sulphate of copper, 5 parts.

2. The following process is employed at the National School of Horticulture at Versailles. The portion of the plant attacked is sprinkled with the following insecticide: Rich tobacco juice, 1 l.; black soap, 1 to 2 kgm.; carbonate of soda, 1 kgm.; lamp alcohol, 1 l.; water, 100 l. Dissolve the soap in the alcohol, and the crystals of soda in water. The liquid is applied with a sprayer. A single application is not sufficient. The treatment should be renewed several times when the spots reappear.—*Le Cosmos*.

3. An effective insecticide for various insect pests on greenhouse plants is composed of the following: Alcohol, 200 parts; soft soap, 20 parts; quassia wood, 6 parts; salicylic acid,  $2\frac{1}{2}$  parts. Macerate for several days; dilute with sufficient water, and apply to the infested parts by means of a brush. Allow to dry, on the following day wash off with plenty of water.

4. Salicylic acid, 1 oz.; soft soap, 2 oz.; quassia, 10 oz.; alcohol, 40 oz. Make a tincture and use as a spray.

5. Spray the plants with a decoction of 100 parts by weight of quassia wood in 1,000 parts of water.

#### Locusts.

We give from *Revue Scientifique* a remedy against locusts, which has proved efficient in Natal: Dissolve equal parts of caustic soda and arsenic in thirty-two times their combined bulk of boiling water. Of this stock solution take 1 gal., dilute it up to 40 gal., add 10 lbs. of brown sugar or syrup. In this solution soak straw or Indian corn stems, etc., and spread on the fields. The locusts, attracted by the sugar, eat the poisonous stems and die, others come and eat the dead locusts and are also killed.

#### Mice.

1. 12 parts nitrate of potash (potash-niter) dissolved in 24 parts of hot water thoroughly mixed with 30 parts of sawdust and 7 parts of coal tar, dried in the air, mixed with starch paste (about 10% starch and 90% water) into a mass, divided into pieces of about  $\frac{1}{2}$  inch thick and  $1\frac{1}{4}$  inches long, well dried and coated with melted sulphur. For the destruction of field mice.

2. Lard, 500 parts; salicylic acid, 5

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### (Mosquitoes)

parts; one onion; suet, 0.50 part; barium carbonate, 500 parts; solution of ammonia, acetate of copper or of verdigris, 50 parts. The onion is cut up fine and fried with the fats until dark brown. The salicylic acid is then added and the mixture strained and stirred until the fat nearly sets. The barium is next added, and, finally, the copper solution.

3.—Trees, To Protect.—A mixture of tallow, 3 parts; tar, 1 part. Applied to the bark while hot, will protect fruit trees against mice.

### Moles.

Bisulphide is effectual for destroying moles on lawns, and for suffocating wasps. It should be poured down the entrance to the nest at night and the orifice immediately closed with a clod of earth.

### Mosquitoes.

*Bites. Remedies.*—1.—Carbolate of lime, 10 gr.; water, 1 dr. It is said that a weak solution of carbolic acid—1 part in 50—used as a wash will prevent their attacks. Also good for gnat bites.

2. To alleviate the unpleasant sensation caused by the bite of the mosquito, various remedies have been suggested. Among them are oil of cloves, ammonia, bicarbonate of soda, chloroform, thymol and ordinary soap. Doctors say we have in our own experience obtained more relief from solution of cocaine, 4%, than from anything else.

3.—Oil of tar, 1 oz.; olive oil, 1 oz.; oil of pennyroyal,  $\frac{1}{2}$  oz.; spirit of camphor,  $\frac{1}{2}$  oz.; glycerine,  $\frac{1}{2}$  oz.; carbolic acid, 2 dr. Mix. Shake well before using.

4.—Eucalyptol, 10 parts; acetic ether, 5 parts; eau de cologne, 40 parts; tincture of insect powder (1 to 5 S. V. R.), 50 parts. Mix. For sponging the skin a mixture of 1 part of this with 3 to 6 parts of water may be used. The tincture is also useful for spraying in apartments; for this purpose 1 part may be mixed with 10 parts water and used in a spray producer.

5.—Naphthalin, 1 dr.; oil of lavender, 2 dr.; alcohol, 2 oz.

*Extermination.*—1.—To clear a room of mosquitoes, take a small piece of gum camphor in a tin vessel and evaporate it over a flame, taking care it does not ignite. A sponge dipped in camphorated spirits and made fast to the top of the bedstead will be found serviceable in the sleeping-room. Decoction of pennyroyal, applied to the exposed parts, will effectually keep off these troublesome insects.

2.—A small amount of pennyroyal

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sprinkled around the room will drive away mosquitoes.

3.—Burning a small quantity of Persian insect powder in a room is said to be efficient in driving away mosquitoes.

4.—Make a paste with mucilage of tragacanth of 500 parts charcoal in powder, 60 parts saltpeter, 40 parts carbolic acid, 250 parts insect powder. Divide into suitable-sized cones and use as fumigating pastilles.

5. Carbolic acid, 4 grams; potassium nitrate, 6 grams; insect powder, 25 grams; wood charcoal, 50 grams; tragacanth, 9.3 grams. Make a mass and form into pastilles, which are to be ignited in the infested room.

6.—Benzoin, 100 parts; balsam tolu, 100 parts; charcoal, 500 parts; insect powder, 150 parts; saltpeter, 50 parts. Make into a mass with water and form pastilles as above.

7.—Dietrich gives the following: Potassium nitrate,  $1\frac{1}{2}$  oz.; mucilage of tragacanth, 2 fl.oz.; insect powder, 2 oz.; althwa, powdered, 125 gr.; tragacanth, 125 gr. Intimately mix the potassium nitrate with the mucilage; also mix the other ingredients together, then incorporate the powdery mixture with the paste, divide the whole into pastilles weighing 30 gr., and dry at a temperature of 20° to 25° C. The pastilles may be bronzed or gilded if desired.

*Preventives.*—1.—Oil of eucalyptus, 30 parts; talc, 60 parts; starch, 420 parts. Apply to hands, face and other exposed portions of the body with a powder puff.

2.—Naphthalin, 1 av.oz.; talcum, 2 av.oz.; starch, 16 av.oz.; oil of pennyroyal, 2 fl.dr. Reduce to fine powder. Rub the powder into the exposed parts of the body.

### Moths.

*Liquids.*—1.—Carbolic acid, 10 grams; oil of cloves, oil of lemon, camphor, of each 5 grams; alcohol (90%), 500 grams.

2.—Benzine is said to be more effective than anything else for exterminating moths, roaches, etc.

3.—Carbolic acid, 1 dr.; camphor, 1 dr.; benzine, 3 oz. Mix and dissolve. May be sprinkled or sprayed where it is required.

4.—Take of cloves, caraway seeds, nutmeg, mace, cinnamon and Tonquin beans, of each 1 oz.; then add as much Florentine orris root as will equal the other ingredients put together; grind the whole well to powder, and then put it in little bags among your clothes, etc. Almost anything aromatic will keep off moths.

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### (Plants)

The common bog myrtle which grows so freely in swampy places is an excellent antidote. A piece of linen, moistened with turpentine and put into the wardrobe or drawers for a single day, two or three times a year, is also a sufficient preservative against moths.

5.—Alcohol, 40 oz.; tincture of capsicum, 5 oz.; naphthalene, 1 oz.; absolute phenol, 1 oz.; menthol,  $\frac{1}{2}$  oz.; oil of lemon grass,  $\frac{1}{2}$  oz. Mix and filter. To be used in the form of a spray by means of an atomizer, where the moths frequent.

*Paper*.—1. Carbolic acid, 1 oz.; ceresine, 1 oz.; naphthalin, 2 oz. Melt, immerse pieces of bibulous paper and dry these on plates.

2.—Naphthalin, 4 oz.; paraffine wax, 8 oz. Melt together and while warm paint unsized paper and pack away with the goods.

*Pastilles*.—Camphor, 5 parts; black pepper, 10 parts; absynthe, 10 parts; patchouli, 2 parts; essence of lavender, 2 parts; essence of cloves, 1 part; paraffine, 100 parts. Melt together and make into pastilles, which are to be burned in closets, drawers, etc., in which furs and clothing are stored.

*Powder*. 1.—Opulim (flour of hops), 1 dr.; Scotch snuff, 2 oz.; gum camphor, 1 oz.; black pepper, 1 oz.; cedar sawdust, 4 oz. Mix thoroughly and strew or put in papers among the furs or woollens to be protected.

2.—Naphthalin, 2 parts; camphor, 4 parts; oil of cinnamon, 2 parts; oil of eucalyptus, 2 parts; patchouli, 10 parts; valerian, 5 parts; tobacco, 2 parts; orris root, 5 parts; sumbul root, 5 parts. All the ingredients to be powdered.

3.—Naphthalin, 2,000 parts; camphor, 1,000 parts; cumarin, 2 parts; nitrobenzine, 10 parts; oil neroli, 1 part.

*Sleigh Robes*.—Alcohol, 1 pt.; camphor,  $\frac{1}{2}$  oz.; dissolve. Spray with this liquid before storing.

### Plants. (See also Aphides; Flower Pots.)

*To Discover Insects*.—1.—If the leaves of the plant turn reddish or yellow, or if they curl up, a close inspection will generally disclose that the plants are infested with a very small green insect, or else with the red spider, either of which must be destroyed. For this purpose scald some common tobacco with water until the latter is colored to a yellow, and when cold sprinkle the leaves of the plants with it; but a better plan is to pass the stems and leaves of the plants between the fingers, and to then shake the plant and well water the bed immediately afterward.

### (Rats)

The latter operation destroys a large proportion of the insects shaken from the plant. This latter method is the only infallible one.

2. For plants, tobacco is of historic usage, in the form of tobacco water or infusion of the tobacco in the form in which it is smoked, and also as part of various kinds of incense used for fumigating plants and greenhouses. Snuff is also used for these powders. The following are two formulae for making them:

a.—Snuff, 50 lb.; powdered white hellebore, 5 lb.; asafetida, 3 lb.; cayenne pepper, 2 lb.; flour, 6 lb. Enough saltpeter is added to make the stuff smolder when set fire to.

b.—Tobacco, 75 lbs.; sulphur, 28 lb.; asafetida, 5 lb.; flour, 3 lb.

### Rats.

A number of the following formulas have been taken from Farmers' Bulletin, No. 369, of the United States Department of Agriculture.

Information concerning rat-proof buildings, traps, and so forth, may be obtained from the same source.

1.—When a house is infested with rats which refuse to be caught by cheese and other baits, a few drops of the highly scented oil of rhodium poured on the bottom of the trap will be an attraction which they cannot refuse.

2.—Place on the floor near where their holes are supposed to be a thin layer of moist caustic potash. When the rats travel on this, it will cause their feet to become sore, which they lick, and their tongues become likewise sore. The consequence is that they shun this locality, and seem to inform all the neighboring rats about it, and the result is that they soon abandon a house that has such a preventive.

*Fumigation*.—Rats may be destroyed in their burrows in the fields and along river banks, levees and dikes by carbon bisulphide. A wad of cotton or other absorbent material is saturated with the liquid and then pushed into the burrow, the opening being packed with earth to prevent the escape of the gas. All animals in the burrow are asphyxiated. Fumigation in buildings is not so effective, because it is difficult to confine the gases. Moreover, when effective, the odor from the dead rats is highly objectionable in occupied buildings.

Chlorine, carbon monoxide, sulphur dioxide and hydrocyanic acid are the gases most used for destroying rats and mice in sheds, warehouses and stores. Each is



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effective if the gas can be confined and made to reach the retreats of the animals. Owing to the great danger from fire incident to burning charcoal or sulphur in open pans, a special furnace provided with means for forcing the gas into the compartments of vessels or buildings is generally employed.

Hydrocyanic-acid gas is effective in destroying all animal life in buildings. It has been successfully used to free elevator and warehouses of rats, mice and insects. However, it is so dangerous to human life that the novice should not attempt fumigation with it, except under careful instructions. Directions for preparing and using the gas may be found in a publication entitled "Hydrocyanic Gas Against Household Insects," by Dr. L. O. Howard, Circular 46, Bureau of Entomology, United States Department of Agriculture, 1907.

Chlorine gas has a strong bleaching action upon textile fabrics, and for this reason cannot be used in many situations.

Sulphur dioxide also has a bleaching effect upon textiles, but less marked than that of chlorine and ordinarily not noticeable with the small percentage of the gas it is necessary to use. On the whole this gas has many advantages as a fumigator and disinfectant. Special furnaces for generating the gas and forcing it into the compartments of ships and buildings are on the market, and many steamships and docks are now fitted with the apparatus. —*Farmers' Bulletin*, No. 369.

*Non-poisonous Spanish Fly Rat Exterminator.* Cantharides, powder, 10 dr.; brown sugar, 2 oz.; malt, ground, 16 oz.; musk, 1 gr.; oil rhodium, 6 gtt.; oil of caraw, 6 gtt. Make into pellets of 5 to 10 gr. The rats, it is claimed, invariably leave the building to die.

*Poisons.* While the use of poison is the best and quickest way to get rid of rats, the odor from the dead animals makes the method impracticable in occupied houses. Poison, however, may be effectively used in barns, stables, sheds, cribs and other outbuildings. Among the principal poisons that have been recommended for killing rats are barium carbonate, strychnine, arsenic and phosphorus.

*Caution.*—In the United States there are few laws which prohibit the laying of poisons on lands owned or controlled by the poisoner. Hence it is all the more necessary to exercise extreme caution to prevent accidents. In several States notice of intention to lay poison must be given to persons living in the neighborhood. Poison for rats should never be

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placed in open or unsheltered places. This applies particularly to strychnine or arsenic on meat.

*Arsenic.*—Arsenic is probably the most popular of the rat poisons, owing to its cheapness; yet experiments prove that, measured by the results obtained, arsenic is dearer than strychnine. Besides, arsenic is extremely variable in its effect upon rats; and if the animals survive a first dose it is very difficult to induce them to take another. Powdered white arsenic (arsenious acid) may be fed to rats in almost any of the baits mentioned under barium carbonate and strychnine. It has been used successfully when rubbed into fresh fish or spread on buttered toast. Another method is to mix 12 parts by weight of corn meal and 1 part of arsenic with whites of eggs into a stiff dough. —*Farmers' Bulletin*, No. 369.

*Barium Carbonate.*—1.—One of the cheapest and most effective poisons for rats and mice is barium carbonate. This mineral has the advantage of being without taste or smell. It has a corrosive action on the mucous lining of the stomach and is dangerous to larger animals if taken in sufficient quantity. In the small doses fed to rats and mice it would be harmless to domestic animals. Its action upon rats is slow, and if exit is possible they usually leave the premises in search of water. For this reason the poison may frequently, though not always, be used in houses without disagreeable consequences. Barium carbonate may be fed in the form of dough composed of 4 parts of meal or flour and 1 part of the mineral.

2.—A more convenient bait is ordinary oatmeal with about one-eighth of its bulk of the mineral mixed with water into a stiff dough.

3.—Spread the barium carbonate upon fish, toasted bread (moistened) or ordinary bread and butter. The prepared bait should be placed in rat runs, about a teaspoonful at a place. If a single application of the poison fails to kill or drive away all rats from the premises it should be repeated with a change of bait. —*Farmers' Bulletin*, No. 369.

4.—Barium carbonate, fresh, 50 grams; barley flour, 10 grams; glycerin, 20 grams; cheese (old), 100 grams. Divide into 100 tablets and sprinkle with flour.

5.—Salicylic acid, 5 grams; garlic, chopped, 1 head; ammoniacal solution verdegis (20%), 50 grams; barium carbonate, fresh, 50 to 100 grams; lard, 500 grams; tallow, 300 to 500 grams. Fry the garlic in the fats, varying the amount of tallow with the season. When the

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garlic is brown, add the barium, then the verdigris.

**Phosphorus.**—Phosphorus is used almost as commonly as arsenic, and undoubtedly it is effective when given in an attractive bait. The phosphorus paste of the drug stores is usually dissolved yellow phosphorus, mixed with glucose or other substances. The proportion of phosphorus varies from  $\frac{1}{4}$  of 1% to 4%. The first amount is too small to be always effective, and the last is dangerously inflammable. When home-made preparations of phosphorus are used there is much danger of burning the person or of setting fire to crops or buildings. The Biological Survey does not recommend the use of phosphorus as a poison for rodents.—*Farmers' Bulletin*, No. 363.

A few formulas follow:

1.—For preparing the electuary, when needed, a phosphorated syrup may be made as follows:

a.—To 200 parts of simple syrup, in a strong flask, add 50 parts of phosphorus and 10 parts of talc powder; place the container in a suitable vessel, and surround it with water heated to 120 to 130° F., and let it stand until the phosphorus is melted. Now cork the flask well, tie down the cork, and agitate until the mixture is completely cold. As a measure of precaution the flask should be wrapped with a cloth.

b.—While it is best to make the phosphorated syrup fresh every time that it is required, a stable syrup can be made as follows: Heat together, very carefully, in a water bath, 5 parts of phosphorus, 3 parts of sublimed sulphur and 30 parts of water, until the phosphorus is completely melted and taken up; then add 30 parts of wheat flour and 6 parts of ground mustard seed, and work up, with the addition of warm water from time to time, if necessary, into a stiff paste, and finally adding and working in from 1 to 2 parts of oil of anise.

2.—Borax, in powder, it may be noticed, is also useful as a preservative of phosphorated paste or the electuary. To make the poison, take 50 parts of rye flour and mix with it 10 parts of powdered sugar. To the mixture add about 40 parts of water and from 30 to 40 parts of the phosphorated syrup, and mix the mass thoroughly.

3.—Millsam gives the following formula for an electuary of phosphorus for this purpose: Granulated phosphorus, 1 part; rye flour, 30 parts; simple syrup, 10 parts; powdered mustard seed, 1 part;

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sublimed sulphur, 1 part; water, 10 parts. Proceed as indicated above.

**Strychnine.**—1.—Strychnine is too rapid in its action to make its use for rats desirable in houses, but elsewhere it may be employed effectively. Strychnia sulphate is the best form to use. The dry crystals may be inserted in small pieces of raw meat, Vienna sausage or toasted cheese, and these placed in rat runs or burrows; or oatmeal may be moistened with a strychnine syrup, and small quantities laid in the same way; or the heads of fried fish are opened, and the powder strewn on the inside. The latter is an especially deadly method, since the odor of the fish acts as a powerful lure, as also do the bits of bacon or other fats used in frying fish. Strong cheese is also a good vehicle for strychnine, acting as a powerful lure for the rodents.

2.—Strychnine syrup is prepared as follows: Dissolve  $\frac{1}{2}$  oz. of strychnia sulphate in 1 pt. of boiling water; add 1 pt. of thick sugar syrup, and stir thoroughly. A smaller quantity may be prepared with a proportional quantity of water and syrup. In preparing the bait it is necessary to moisten all the oatmeal with the syrup. Wheat and corn are excellent alternative baits. The grain should be soaked overnight in the strychnine syrup.

3.—Strychnine wheat, or strychnine oats (strychninweizen or strychninhafer), in the proportion of 1 part of strychnine to 100 or 150 parts of wheat or oat flour, is prepared by dissolving 1 gram of strychnine in 40 to 50 grams of hot water, mixing well with the flour, and drying in the water bath.

**Squill.**—1.—The preparation of the squill as a rat poison can be effected in several different ways. Usually, after the removal of the outer peel, the bulb is cut up into little slices and mixed with milk and flour; these are stirred into a dough or paste, which, with bits of bacon rind, is put into the oven and baked.

2.—Another plan is to grate the squill on a grater and mingle the gratings with mashed, boiled or roasted potato. This method of preparing them necessitates the immediate use of the poison.

3.—The following is, however, a stable preparation that keeps well: Hog's lard, 500 grams; acid salicylic, 5 grams; squill, 1 bulb; beef suet, 50 to 100 grams; barium carbonate, 500 grams; solution of ammonium copper acetate, 20%, 50 grams. Cut or grate the squill into very small pieces, and fry it in the lard and suet until it has acquired a dark brown color and

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### (Roaches)

the fats have taken up the characteristic squill odor; then to the mess add the other substances, and stir well together.

**Poultry Houses, Poison in.**—For poisoning rats in buildings and yards occupied by poultry, the following method is recommended: Two wooden boxes should be used, one considerably larger than the other, and each having two or more holes in the sides large enough to admit rats. The poisoned bait should be placed on the bottom, and near the middle of the smaller box, and the larger box should then be inverted over the other. Rats thus have free access to the bait, but fowls are excluded.

### Roaches and Water Bugs.

1.—Borax is the best cockroach exterminator yet discovered. This troublesome insect has a peculiar aversion to it, and will never return where it has once been scattered. As the salt is perfectly harmless to human beings, it is much to be preferred for this purpose to the poisonous substances commonly used.

2.—Mixture of red lead, Indian meal and molasses will be eagerly eaten by them, and will soon exterminate them. Paris green, phosphorus, or arsenic, are sometimes used, but are very dangerous. Borax, to which cockroaches have a great antipathy, will drive them away.

3.—Corrosive sublimate, sprinkled around the places which the roaches infest will kill them quickly. Be careful, however, with this substance.

4.—A good plan is to render the place which the roaches frequent perfectly dry, and then coat the boards or shelves with a strong decoction of quassia. When this has become thoroughly dry cover the boards, etc., with clean paper. Other bitter substances may be used in place of quassia.

5.—A good plan is to dissolve a little shellac in solution of borax, add a very small quantity of bichloride, and to paint the solution into the cracks and corners. If water or dampness is kept away from the shelves or closets, the roaches will leave the place of their own accord.

6.—Chamomile, 2 oz.; borax, 12 oz.; insect powder, 2 oz.; plaster of paris, 1 oz.; sulphur, 3 oz.; crude arsenic (so-called cobalt), 120 gr.

7.—You can make a roach poison which is practically harmless to man by the following formula: Borax, 9 oz.; starch, 2½ oz.; cocoa, 1 oz.

8.—Another preparation, not so inactive as to human beings, is made by mixing angelica root, in fine powder, 5 oz.,

### (Trees, Protecting)

and oil of eucalyptus, 1 oz. Scatter at night plentifully around the haunts of the pests.

9.—Ethereal oil of cherry laurel, 2 parts; essence of cloves, 2 parts; essence of bergamot, 2 parts; oil of turpentine, 2 parts; camphor, 5 parts; garden pepper, 15 parts; alcohol, 1,000 parts. Digest, and filter.

10.—Corn starch, 8 oz.; powdered sugar, 16 oz.; powdered quicklime, 4 oz.; powdered borax, 4 oz. Have the ingredients thoroughly dry before mixing, and preserve in a tight box. Scatter where the insects frequent, or use with a powder blower. This is said to be quite efficient.

### Sheep Dips.

1.—White arsenic, 6 av.oz.; potassium carbonate, 6 av.oz.; water, 14 gal. Add the arsenic and potash to a portion of the water, and boil until solution is effected, then add the rest of the water.

2.—White arsenic, 6 av.oz.; soft soap, 6 av.oz.; potassium carbonate, 6 av.oz.; sulphur, 4 av.oz.; bruised hellebore, 2 av.oz.; water, 14 gal. Boil the ingredients in a portion of the water for half an hour, then strain through a sieve, and add the rest of the water.

3.—Corrosive sublimate, 1 av.oz. Dissolve the salt in 4 gal. of water. This dip has been used with success in Australia.

4.—Tar oil (30% carbolic oil), 50%; rosin soap, potash base, 20%; water, 30%. Dissolve the rosin soap in the water, then incorporate the carbolic oil. Use 1 lb. of this solution to 14 gal. of water as a dip. May also add some arsenic to increase its germicidal effect.

### Trees, To Protect from Climbing Insects.

Any combination of cheap greases with tar, pitch, rosin or ozokerite, which will remain sticky when cold, and not melt too easily, may be smeared around the trunks of trees to prevent insects from crawling up them. The following combinations are suggestive, and may be modified to suit. Any combination which is soft or sticky at 40°, and will not run at 130°, can be used:

1.—Pitch, 12 parts; rosin, 10 parts; rosin oil, 2 parts.

2.—Tallow, 7 parts; palm oil, 5 parts.

3.—Ozokerite, 15 parts; petroleum, 3 to 6 parts.

4.—Rosin, 4 parts; linseed oil, 1 part; molasses, 1 part. Boil together.

5.—Rosin, 12 parts; rosin oil, 12 parts; soda lye, 1 part. Boil together.

### *Insecticides and Extermination of Vermin*

(Trees, Protecting)	(Trees, Protecting)
<p>6.—Tar, 10 parts; rosin, 5 parts; palm oil, 8 parts.</p> <p>7.—Prussic acid has recently been largely and very successfully employed for freeing trees from insect pests, especially in America. The tree is covered up for the time being in a sort of tent, under which the fumes of the acid are set free, and by which they are confined</p>	<p>for a sufficiently long time in contact with the tree. Prussic acid, being the most deadly poison with which we are acquainted, naturally requires careful and responsible handling, but its efficacy against insects is unquestionable, as every entomologist who keeps a cyanide bottle is well aware. (See also <b>Ants</b>; <b>Mice</b>.)</p>



## CHAPTER XVI

# LAPIDARY ARTS—ARTIFICING IN HARD MINERALS, IVORY, BONE, HORN, SHELL CORAL, JET, MEERSCHAUM, SOFT MINERALS, ETC.

### Agates.

*Coloring and Dyeing.*—1.—Red agates are often made in Oberstein by soaking them for a fortnight in nitric acid containing iron, and after drying them two weeks they are baked.

2.—The black colors are produced by warming them for 14 days in a sweet liquid that contains honey, and then boiling them several days in oil of vitriol.

3.—Bright blue colors are obtained by the use of a bath of perchloride of iron, followed by yellow prussiate of potash.

4.—A favorite shade of green is obtained by the use of nickel salts, followed by a soda bath.

Yellows are obtained by crude muriatic acid or bichromate of potash.

*Polishing.*—1.—Quartz and agate are slit with a thin iron disk supplied with diamond dust moistened with brick oil. The rough grinding is done on a lead wheel supplied with coarse emery and water. The smoothing is done with a lead lap and fine emery, and the polishing may be accomplished by means of a lead lap whose surface is hacked and supplied with rotten stone and water.

2.—This substance, although much harder than carnelian, is cut and polished in the same manner. (See *Carnelian*.)

### Alabaster.

The general modes of working alabaster, as regards its configuration, are with saws, chisels, files, hand turning tools; but it is polished quite differently by the sculptor, in chiseled or carved works; by the marble-worker, in turned works; and by the lapidary, in small objects of *bijouterie* and *verru*.

1.—*Chiseled or Sculptured Works.*—The dull or dead parts of sculpture, after having been carved with chisels, are first smoothed with bent rasps and files, known as *riflers*; and, secondly, are afterwards

scraped with a triangular scraper. Thirdly, they are additionally smoothed with fish-skin or glass-paper, and, fourthly, with Dutch rush used with water. (See *Marble*.)

2.—*Turned and Polished Works.*—When the article is finished with the turning tool, take first a piece of very fine soft sandstone, and apply it with water to the work, whilst it is in quick revolution, moving the stone all over until there is worked up a body of mud; secondly, take a wet rag, and work this sludge well on the alabaster, then wash the work clean; and, thirdly, apply a rag, charged with putty powder and water, until there is a gloss upon the work. Fourthly and lastly, apply another rag, charged with a mixture of putty powder and soap and water, for a short time, and wipe the alabaster dry, which completes the polish.

3.—*Treated by the Lapidary.*—In working alabaster to the required forms, the lapidary first employs, as usual, the slitting mill, which is a thin plate of iron fixed on a vertical spindle, and made to revolve with moderate velocity. The edge of the slicer is charged with diamond powder, and lubricated with the oil of brick. This instrument, which may be considered as the circular saw for small stones, is used with light pressure and plenty of brick oil. Secondly, the alabaster is *roughed*, or roughly ground on what the lapidary terms a *roughing* or *lead mill*, namely, a flat circular plate of lead, fixed on a spindle similar to that of the slicer; the mill, or lap, therefore, travels in a horizontal plane, and is abundantly supplied with coarse emery and water by means of a brush. The stone is moved to and from the center of the rapidly revolving lap, until all the marks from the slitting mill are removed, and the stone is reduced to a flat surface.

Always consult the index when using this book.

## Lapidary Arts

### (Alabaster)

Thirdly, the alabaster is *smoothed* on the same lead mill with coarse emery; but prior to smoothing the stone, the grains of the coarse emery previously used, and that remain on the lap, are rubbed down fine with a smooth lump of emery stone. It would apparently be a better practice to use two different laps, and, together with them, emery of two different sizes; as, in the first place, the operation of smoothing the mill is tedious; it also tends to wear away the lap towards the edge; thus degenerating the plane or flat surface into an irregularly coned surface, with which it is impossible to grind works accurately flat; and, moreover, if any coarse grains of emery are left in the lap, they greatly retard the smoothing, and consequently the polishing also. Indeed, it will be found a most erroneous practice to hurry over any one process with the intention of making up for it in the next; for, as each stage of the work requires successively finer polishing powders, the various steps should be continued the proportional times, or ultimate success will be more tediously if at all attained. As it is difficult to polish alabaster, and substances equally soft, on the inelastic lead lap with rottenstone (the means usually employed for harder stones), the following is the course ordinarily followed. After the roughing-mill has been used, the stone is smoothed on a *wood-mill*, or a disk of mahogany, used with flour-emery and water. On account of the greater elasticity of the wood-mill, and the slight roughness of its face from the rubbing up of the fibres, it acts more quickly and satisfactorily than the metal tool. Fourthly, the earlier stage of the polishing is accomplished on a *list-mill* with pumice stone and water; but as the list, which is wound on spirally, is very elastic, flat works must be lightly applied, or they will sink into the soft face of the list mill and become rounded at the edges. Fifthly, the polishing is completed on a leather lap, or a thick piece of buff leather pasted securely on a wooden disk, and supplied with fine putty powder and water. Sometimes, indeed, the naked hand and a little moistened putty powder are finally used for the last polish. The following substances are worked by the lapidary in nearly or exactly the same manner as alabaster: Amber, cannel coal, coral, enamels, glass, jet, lava, malachite, mother of pearl, nautilus shells, opal, satinstone, steatite, turquoise.

4.—*Staining or Coloring*.—1.—Mix various colored powders or solutions with the plaster, at the time of mixing it up with

### (Amber)

water. A little terra de Sienna, in very fine powder, or ground with water, added to the water employed to mix up the plaster, imparts a pleasing color to busts, statues, medallions, etc.

2.—Objects formed from the solid alabaster may be stained in the same way, and with the same materials as marble. (See *Marble*.)

#### Amber.

*Bending*.—Drop it into hot beeswax. After it has been immersed for a few minutes, remove it, and, holding it before the fire, bend it to the desired shape.

*Cement*.—1.—Cement for amber may be made by dissolving gum copal in ether to form a syrupy fluid. The broken pieces should be warmed slightly, the cement quickly applied, and two pieces brought close together and bound with wire. The cement sets quickly, and the excess may be pared off with a sharp knife.

2.—Smear the parts which are to be united with linseed oil, hold the oiled part carefully over a small charcoal fire, a hot cinder, or a blue gas flame, being careful to cover the rest of the object loosely with paper; when the oiled parts have begun to feel the heat, so as to be sticky, pinch or press them together, and hold them so till nearly cold. Only that part where the edges are to be united must be warmed, and even that with care, lest the form or polish of the other parts should be disturbed; the part joined generally requires a little repolishing. A solution of potash, or a solution of mastic in linseed oil, may replace the boiled oil.

*Etching*.—Use a ground of white wax and oil of turpentine,  $\frac{1}{4}$ , thickened with very finely powdered white lead, and etch with very dilute acetic or hydrochloric acid.

*Imitation Amber*.—1.—Dissolve shellac in an alkaline lye, then pass chlorine through the solution until the whole of the lac is precipitated. After washing in water, this must be melted and kept over the fire until it runs clear, taking care that it does not burn; it should then be poured into molds of the size of the pieces required.

2.—Mix pure bleached shellac and keep it over the fire until it runs clear, with care to prevent burning. It may be poured into molds of the size of pieces required. The operation requires considerable management. The darkest and hardest pieces of gum copal are also substituted for amber. The copal may be fused with the shellac.

## Lapidary Arts

### (Amber)

**Molding Amber.**—If amber is to be molded, it should be boiled in rape or linseed oil for several hours; this makes it plastic, when it can easily be molded. This process softens but does not dissolve it. (See also *Bending*, above.)

**Polishing Amber.**—1.—A simple process of polishing amber is to smooth it with whetstone and water, and then rub with whiting and water, followed by oil applied on a piece of flannel. When the friction heats and electrifies the amber, lay it aside to cool, or it may fly to pieces.

2.—The more general method of polishing amber is the following: First it is filed to a fairly smooth surface. It is then rubbed with rotten stone and oil with a flannel, followed by dry rotten stone applied with the palm of the hand.

3.—Amber turned in the lathe is smoothed with glasspaper and polished with rotten stone and oil.

4.—The lapidary polishes amber first on an iron lap with diamond dust and oil; then on a lead lap with coarse emery and water, followed by fine emery and water; then with flour emery and water on a mahogany lap; then on a list-mill with pumice powder and water; and, finally, on a leather lap or piece of buff leather with fine putty powder and water. Sometimes moist putty powder applied by the palm of the hand follows the leather lap.

5.—Amber that has facets is polished on pewter laps with crocus. Except that the amber is held in the unaided fingers, the process resembles the cutting and polishing of gems.

**Varnish.**—(See **PAINTS AND VARNISHES**.)

**Working.**—1.—Amber in the rough is first split and cut rudely into the shape required by a leaden wheel worked with emery powder, or by a bow saw having a wire for the blade, tripoli or emery powder being used with it. The roughly formed pieces are then smoothed with a piece of whetstone and water. The polishing is effected by friction with whiting and water, and finally with a little olive oil laid on and well rubbed with a piece of flannel, until the polish is complete. In this process the amber becomes hot and highly electrical; as soon as this happens it must be laid aside to recover itself before the polishing is continued, otherwise the article will be apt to fly into pieces.

2.—Amber is worked in a lathe, polished with whiting and water or oil, and finished off by friction with flannel. Dur-

### (Bone)

ing the operation the pieces often become hot and electrical, and fly into fragments, to avoid which they should be kept cool, and only worked for a short period at a time.

3.—Anoint the edges to be joined with linseed oil, and hold them over a charcoal brazier or near a gas jet until the parts become sticky, taking the precaution to wrap paper round the other parts. Press them together, and hold till cold. Polishing is effected first with whiting and water and then with olive oil and a bit of felt or cloth.

### Amethyst,

or violet quartz, is cut and polished by the lapidary like Carnelian.

### Aquamarine,

Called also beryl and ancient beryl, is of various shades of pale yellow, green and blue; it was so named from its resemblance to sea-water, and is worked like Carnelian, which see.

### Artificial Gems.

For information on the Manufacture of Artificial Diamonds, Rubies, Sapphires, etc., see *Scientific American Supplement*, Nos. 1107, 1472, \*1335, 1716, 1717, 1738 and \*1803. (\*) Denotes illustrated articles.

### Bone.

**Bending.**—If the bone is thin, prepare a solution of common washing soda and water, and heat to boiling point. Immerse the bone, and boil for 30 minutes; then, assuming it to be a bone mouth-piece, push through it a piece of soft steel wire the size of the bore of the bone, bend to the required curve, and withdraw the wire, leaving the bone to set. If the bone shows a tendency to go back to its original curve, bind a bit of soft doubled wire round each end, slip a bit of wood or metal between the strands, and screw tight after the manner of the "stretcher" of a bow-saw. Thick bone should be immersed in phosphoric acid, which may require dilution.

**Bleaching.**—1.—Bone has a great tendency to become yellow, both by use and by exposure to the atmosphere. For commercial and artistic uses the bones are steamed at a very high temperature, and in this way all the fatty matter contained therein is extracted. After the bone is dressed with file and scraper, polish with a revolving brush with whiting and water, and finish in the same way with dry whiting.



## Lapidary Arts

### (Cameo Cutting)

2.—Previous to the bleaching proper, the bones should be boiled in a solution of soda to remove the grease, after which they may be placed in an earthenware pot and covered with a mixture of hydrogen peroxide and dilute ammonia. If the earthenware pot be now placed in a warm situation the bleaching will proceed rather rapidly, a final washing in water being all that is required. A mixture of equal parts of ammonia (weak) and hydrogen peroxide, followed by clear water, may be used as baths for bleaching bone.

*Cleaning.* Stains partly due to fat or grease can be removed by soaking the articles for 24 hours in benzine, and allowing to dry slowly. Many other stains and discolorations can be removed by steeping the bones in a solution of hydrogen peroxide to which a little ammonia has been added to render it alkaline, as shown above.

*Hardening.*—(See also *Ivory*; *Horn*.)

Bones can be hardened and the soft pores closed by soaking for a week or two in a solution of silicate of soda, 1 part, and water, 3 parts, and then for a similar length of time in chloride of calcium solution, 1 part, and water, 3 parts. The process could no doubt be hastened by boiling the bones alternately in these liquids. It will be best to rinse the bones in water after the first treatment and before putting them in the second solution, otherwise there will be formed on the outside of the bones a deposit which will render them unsightly in appearance.

*Polishing.*—After the turning-tool or scraper has been used, bone is polished: First, with glasspaper; secondly, with Trent sand or Flanders brick with water on flannel; thirdly, whitening and water on woolen rag; fourthly, a small quantity of white wax is rubbed on the work with a very quick motion; the wax fills the minute pores; but only a very small quantity should be allowed to remain on the work. Common bone works, such as nail and tooth brushes, are frequently polished only with slaked lime used wet on flannel or woolen cloth.

### Cameo Cutting.

Take the common helmet, or the red helmet shell (those shells whose inner surface is pink or dark-colored are most suitable), cut them into squares with a lapidary's mill, round off the corners, and shape them into an oval on a wet grindstone. Fix the enamel side on a short stick with jewelers' cement, grind off the brittle surface, sketch the subject with

### (Carnelian)

a black-lead pencil, cut the subject with engraver's tools, namely, a chisel tool to clear the bare places; a lozenge shape for forming the subject, and a scraper, made of a three-angled file, ground off taper to the point, for cleaning the enamel surface around the subject and also for forming the lineaments and other delicate parts. The color on the cheeks and hair is produced by leaving the layer of colored shell on those places. The stick must be grasped in the left hand, and held firmly against a steady bench, and with the tool resting in the hollow of the right hand, dig away the shell. A convenient length for the tools is  $3\frac{1}{2}$  in.; they must be kept in good condition to work with accuracy. The cameos are polished with a cedar stick, or a piece of cork dipped in oil of vitriol and putty powder, and cleaned with soap and water. Mother-of-pearl is carved in the same way.

### Cannel Coal.

In polishing flat works of this material, such as inkstands, water of ayr stone, in the stick, is first used with water; secondly, charcoal dust and soft soap on a flannel; and although, thirdly, for fine works, rotten stone on the hand or flannel have been used, it is better to continue the second process until the completion, adding only additional soft soap, with water, as a lubricator. For objects turned in the lathe the water of ayr stone is superseded by emery paper. The lapidary works cannel coal just as he would alabaster.

### Carnelian

This substance has been selected as the example of the mode of cutting and polishing stones of a medium degree of hardness, the two other examples being alabaster for the softest stones, and sapphire for the hardest, excepting alone the diamond, which last is worked in a manner peculiar to itself, and is separately considered.

1.—Carnelian, when operated upon by a lapidary, is first slit with the thin iron slicer, fed with diamond dust and moistened with brick oil; secondly, it is rough-ground on the lead mill, with coarse emery and water; and thirdly, it is smoothed either on the same lap rubbed down fine, or with a similar lap used with fine emery; thus far, the steps are precisely as explained with regard to alabaster. Fourthly, carnelian, and stones of similar or superior hardness, which are not smaller than about 1-3 of an inch

## Lapidary Arts

### (Carnelian)

in diameter, are in almost all cases polished on a lead mill plentifully supplied with rotten stone and water; but this fine powder will scarcely adhere after the manner of the coarser and granular emery, or by simple pressure; and therefore to expedite the process, the face of the polishing lap is hacked, or jarred, although in a manner quite different from that pursued by the cutler.

The lapidary employs the blade of an old table-knife, which he holds slenderly between the thumb and the finger, placed near the middle of the blade, while the front part of the edge rests on the lap, not perpendicularly, but slanted a little forwards, so as to meet the lap edge foremost during its revolution. The unstable position of the knife causes it to jump, vibrate, or chatter on the lap, and at each jump it makes a very slight furrow; these fill the face of the mill with minute lines, or grooves, that serve for the lodgment of the finely powdered rotten stone. It is, however, to be observed that the wheel should be made first to revolve in the one direction and then in the opposite, that the marks of the hacking-knife may cross each other.

2.—Smaller and harder stones are more commonly polished on a pewter than a lead lap, and for the smallest and hardest stones a copper lap is preferred; but all the polishing tools, of what metal soever they may be made, are hacked as above described, and used with rotten stone and water.

3.—Rounded or Convex Stones, or those said to be cut *en cabochon*, whether of carnelian or even several of the harder stones, are in many cases successively wrought by means of the wood mill with fine emery, the list mill with pumice stone, and leather lap with putty powder, precisely as described under the head **Alabaster**. This is done on account of the greater elasticity of these apparatuses, which enables them to ply more conveniently to the globular forms of the works to be polished, and avoid wearing them in ridges or flat places.

4.—Faceted works, on all stones and hard substances, are, for the most part, cut by the lapidary after one of three different modes. First, for pastes, or artificial stones, and many soft stones, as amber, carnelian, jet, etc., the facets are usually cut on a lead wheel with emery, and polished on pewter with rotten stone. Secondly, for some of a harder kind, but inferior in hardness to sapphires, the succession of tools is a pewter lap and fine emery for the cutting, and a copper lap

### (Coral)

with rotten stone for the polishing. Thirdly, for sapphires, the chrysoberyl, and rarely for some few others likewise, a copper lap with diamond powder is used for cutting the facets, and a copper lap with rotten stone for polishing them. And fourthly, with the diamond, two stones are rubbed in a peculiar manner, the one against the other, to cut the facets, and they are polished by means of the *drop*, and an *iron* lap, or *skive*, fed with diamond powder.

5.—From the comparatively small size of the stones and gems that are cut into facets, they cannot generally be held unassisted in the fingers; the stone is consequently cemented centrally upon the end of a round stick of wood, nearly like a drawing pencil. The stick, when held *vertically*, gives the position for grinding the central facet or *table* of the stone; the stick is inclined to a certain angle for the 8, 12 or more facets contiguous to the table, of which facets, 2, 3 or 4 series are commonly required at different inclinations; and lastly, the *horizontal* position of the stick serves in cutting the girdle or central band around the exterior edge of the stones. The several inclinations of the stick on which the stone is cemented are easily determined by placing the upper end of the stick into one of several holes in a vertical post, fixed alongside the lap, and this retains the inclination very accurately and simply.

6.—The following substances are worked by the lapidary in nearly or exactly the same manner as carnelian, and descriptive articles are introduced in the catalogue upon each of these particular substances, pointing out their principal external features, and also by any peculiarities of method pursued, either by the lapidary or other artisan, as the case may be, in working them.

Substances treated by the lapidary like carnelian: Agate, amethyst, aquamarine, beryl, bloodstone, carbuncle, catseye, chalcodony, chrysolite, chrysoprase, crystal, emerald, felspar, flint, fluorspar, garnet, granite, heliotrope, jade, jasper, lapis lazuli, marble, onyx, opal, pastes, peridot, porphyry, quartz, sard, sardonyx, serpentine, topazes.

### Coral.

**Bleaching and Cleaning.**—To bleach coral, wash it in clean water with a soft toothbrush; then steep it for about an hour in a chloride of lime solution containing 2 oz. of chloride of lime and  $\frac{1}{4}$  oz. of hydrochloric acid in 1 pt. of water; finally wash it in running water for an-

## Lapidary Arts

### (Coral)

other hour. The following method answers for large pieces of white coral that have been soiled with dust, etc.: Dissolve 4 oz. of strong hydrochloric acid in 4 pt. of water; place this in an earthenware basin, as the acid attacks metal. Dip the coral in the solution for a few seconds only; the upper layer of the coral will be dissolved off, carrying the dirt with it, leaving the coral perfectly white. Now place it in clean water, changing the water two or three times; then remove, shake, and dry in a warm place. Another method: In a large pan full of soapuds hang the coral in a net so that it is submerged, but does not touch either the sides or bottom of the pan, and place the pan on the fire, and boil. Next take it off, throw away the water, wash the coral in clean water, replace it in the net, and put it back in the pan, as before; fill up with clean water, and again bring to the boil. Then take the coral out, rinse in clean water, and allow to drain.

**Cutting and Polishing.**—Coral can be cut with a hard steel saw, such as watchmakers use for cutting metals, but it is slow work, and the saw will require frequent sharpening. It can be drilled by a hard steel drill. Lumice powder on a rag or a revolving buff will polish it.

**Polishing.**—The red variety of this singular substance is somewhat used in jewelry, and admits of an excellent polish. When in rounded pieces, it is polished after the routine followed by the lapidary with **Alabaster**; when coral is cut in facets, as for beads, etc., it is worked like **Carnelian**.

**Imitation Coral.**—To 2 dr. of vermilion add 1 oz. of rosin, and melt them together. Have ready the branches or twigs, peeled and dried, and paint them over with this mixture while hot. The twigs being covered, hold them over a gentle fire; turn them around till they are perfectly smooth. White coral may also be made with white lead, and black with lampblack mixed with rosin.

2.—Artificial coral can be made of 4 parts of yellow rosin and 1 part of vermilion, melted very thoroughly together.

3.—To Color Imitation Coral, Made from Alabaster.—Bath: Cream of tartar, 1 part; tin composition, 0.5 part; water, 1,000 parts. Tin composition: Nitric acid, 8 parts; sal ammoniac, 1 part; tin, 1 part; water, 25 parts. Add powdered cochineal to saturation, and boil; allow to cool, and decant. Place the alabaster in the clear fluid, keep it boiling there for 1 hour, dry it in the air, and

### (Diamond)

finally place it for 3 hours in a bath of equal parts of stearic acid and wax. Take it out, wipe and polish it.

**Stringing.**—If the perforations in the coral are sufficiently large, it will be best to string the coral on the finest steel or copper wire. If the perforations are small, use a fine silk or linen thread; these are much stronger than the ordinary cotton thread.

### Crystal or Rock Crystal.

A popular name for quartz. The Brazilian pebbles for spectacles are lenses ground out of pure, transparent, colorless quartz; the stone is cut into slices by the lapidary; afterward it is snipped into the form of the lenses with nippers which resemble wide, flat pliers, and made of soft iron, in order that the quartz or glass may slightly imbed itself, to gain a hold, which could not take place with the hard steel faces of ordinary pliers; lastly, the pieces of crystal are ground into the form of lenses, and polished by the optician, exactly in the same mode that he employs for glass lenses.

### Diamond.

1.—**Diamond Powder for Lapidaries' Use.**—Lapidaries generally purchase small, imperfect diamonds and the fragments removed by splitting or cleavage in preparing stones for jewelry. These fragments are crushed in a hardened steel mortar, with a cylindrical hole about  $\frac{1}{2}$  in. in diameter, and nearly 2 in. deep; the bottom of the cavity is hemispherical, or constitutes perhaps the third part only of the circle; the pestle almost fits the aperture of the mortar, and is curved to the same degree; there is also a cover that fits the recess in the mortar to prevent the escape of any of the valuable dust. The pestle is struck a few blows with a light hammer, and is twisted around between each blow; this readily crushes the diamond, which, although so incomparably hard, is brittle from its crystalline structure. The fragments are carefully collected and mixed with a little of the oil of brick, in a small cup, or any convenient vessel, which should have a cover to keep the prepared diamond from being wasted. When not wanted for immediate use, the prepared diamond is kept in a pasty condition between two very small watch glasses, cemented with soft wax around their edges.

2.—**Diamond Powder for Seal Engravers.**—This is required to be much more finely pulverized than for lapidary work; therefore, having been crushed as above,

## Lapidary Arts

### (Diamond)

the fragments are ground into a thick paste, with a few drops of olive oil, in another pestle and mortar of hardened steel, the surfaces of which are both exactly spherical, with a curvature of from 1 to 2 in. radius; this mortar has a fin cover, that it may serve as the recipient for the powder which has been ground. Sometimes, for reducing the powder after it has been crushed, flat grinders of hardened steel are employed, but these are less generally used than the spherical form. Rough diamonds of a dark steely color are generally selected by the seal engravers, as these are considered the hardest stones.

3.—*Diamond Powder for Watch Jewellers.*—These artisans, who use much larger quantities of diamond powder than the above, for cutting as well as for polishing rubies, sapphires and topazes, pursue a different method. They purchase the fine dust, or *diamond bort*, that is rubbed off stones used for jewelry in the act of cutting them into facets, in which process two diamonds are operated upon at once, and caused mutually to abrade each other in forming the one facet on each stone. The diamond bort is usually washed for its separation into two or three sizes, exactly after the manner of washing emery, except that the process is carried on upon a very much smaller scale, and the finest olive oil is used instead of water. The diamond powder is generally laid by under a stratum of oil to prevent waste; oil is employed because of its viscosity; it does not allow the diamond to subside so quickly as water, and it is, moreover, the fluid always employed in the using and preservation of the diamond by these artisans.

A.—*The Application of Diamond Powder to the Splitting or Sawing of Minerals.*—The coarser diamond powder used for grinding or cutting is generally burnished into the surface of the iron lap, or *skive*, of the diamond worker, and frequently also into the iron, copper, or other laps used by different artisans. In cutting sapphires, the lapidary works the diamond powder into the copper lap with a smooth piece of agate applied with gentle pressure. The finer diamond powder used for polishing is simply applied on the surface of the tools, with the finger, or a small flattened wire used as a spatula. The gem engraver puts the diamond in minute hollowed disks of tin, two of which, in fact, are soldered to a strip of tin, and worn on the forefinger of the left hand as a ring; the one disk,  $\frac{1}{2}$  in. in diameter, contains the mixed

### (Emery Wheels)

diamond paste, the other disk one or two drops of the oil of brick, with which the tool is frequently lubricated. Diamonds themselves can only be recut by experts, and is far beyond the amateur's province.

#### Emery Paper.

Emery paper is extensively employed for cleaning and polishing metals, but all the kinds in use hitherto have the great disadvantage of not retaining an equal efficiency. The fresh parts bite too much, and the paper itself soon gets worn through in places. Emery on linen has been tried, with good success. The emery paper recommended by the *Manufacturer and Builder* is not a pasteboard with emery on both sides, but a board in which emery enters as a constituent part. Fine and uniform cardboard pulp must be procured, and 1-3 to  $\frac{1}{2}$  its weight of emery powder thoroughly mixed with it, so that the emery may be equally distributed. The mass is then poured out in cakes of 1 to 10 in. in thickness. They must not be pressed hard, however, but allowed to retain a medium pliability. This paper will adapt itself to the forms of the articles, and will serve until completely worn out.

#### Emery Wheels.

1.—Can be made with shellac, powdered fine, and a small portion of rosin, a piece about the size of a walnut, to 1 oz. of shellac, and a piece of old vulcanized india-rubber about the same size, which gives it toughness. Shellac about 1 oz. to 1 lb. of emery, well melt, and stir about in a small fryingpan; well mix the powders before applying heat. Be careful not to burn it, or get grease in it; have a ring of iron and a piece of plate iron prepared with black lead and beer pretty thick; place the ring upon the plate and make a mold, turn the stuff into it, and well ram down evenly; put on one side to cool; when cold, turn out and chuck in lathe, and with a piece of red hot iron bore a hole for spindle; after spindled put between centers, and trice up with hot iron. Very good grindstones may be made with silver sand mixed with powdered glass, and it is necessary to have some body besides shellac for coarse emery to form a body to bod the grains in. Emery dust from grinding glass, and turkey stone slips, and slate, may be used as a substitute for the flour.

2.—Good emery wheels are formed of clean emery compounded with just enough boiled linseed oil, the mixture being agitated for a sufficient period under ex-

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(Gold)

posure to a considerable heat and free access of atmospheric air, or some still more powerful oxidizing agent, until it assumes the necessary degree of tenacity, and, while warm, being exposed to hydraulic pressure in a suitable mold, and subsequent drying in a stove, when the emery wheel is complete.

### Fluorspar.

This substance, from the confusion in the arrangement and the fragility of its crystals, requires a peculiar and careful treatment while being turned into form. The smoothing and polishing are conducted almost the same as in marble; but as fluorspar requires a longer continuance of the polishing process, it demands considerable care to preserve the square fillets of the work from being rounded in the polishing, and with which object the powders are sometimes applied on small square slips of metal or wood, the sides of which are used somewhat as a file, so as to present a superior degree of definition and permanence in the form of the polishers, than would be obtained by the exclusive use of cloth applied with the fingers. The lapidary pursues the same method in polishing fluorspar as carnelian.

### Garnets.

Worked by the lapidary just like carnelian, so far as the succession of the tools is concerned.

### Glass.

Glass is polished in various different manners, some of which are elsewhere particularized. Thus, plate glass is roughed with sand, smoothed with emery, and polished with crocus. Glass lenses are roughed out with sand, figured with emery, and polished with putty powder. Cut glass for household purposes and toys is roughed with sand, smoothed on a grit-stone, then with pumice stone, and lastly is polished with rouge, putty or rotten stone.

### Gold.

Gold is, in general, polished much the same as silver, although some variation is made, as works in gold are, in general, much smaller, and do not require such active means as those in silver.

1.—Gold is first polished with water of ayr stone, in the stick, used with water; secondly, with slips of wood, with coarse crocus; and thirdly, with a buff stick and fine crocus or rouge. The black polish, which is so much esteemed, is

(Horn)

given with the naked hand and rouge, but the perfection of the polish depends on the peculiar texture of the skin, as the hands of some individuals do not at all answer the purpose.

2.—Flat works in gold are treated by cutlers and others first with water of ayr stone, in the stick, with water; secondly, charcoal, in the stick, with water; thirdly, boxwood and rouge, very nearly dry.

3.—Cut or faceted gold is wrought upon pewter laps, with crocus; the process closely resembles the cutting of facets on gems.

### Horn.

*Bleaching.*—To bleach horn white, try soaking in ammonia solution and then in hydrogen peroxide. Only light-colored horn would be suitable for bleaching.

*Buffalo Horns.*—To color the brown streaks black on buffalo horns, after they have been polished, apply a dilute solution of nitrate of silver with a brush or rag several times, until the desired intensity is obtained. Allow it to dry in the sun after each application before applying the next coat. Polish when sufficiently black.

*Coloring Light Horn in Imitation of Tortoise Shell.*—To effect this, prepare a mixture of equal parts of burned lime, potash, oxide of iron and pulverized graphite, rub all the ingredients thoroughly together, and add enough water to make them into a thin paste. The horn, polished to a finish, is dipped for a short period in warm dilute nitric acid, and then laid in cold water, then dried thoroughly, and after a time the paste above described is applied to the parts to be colored brown by means of a small pad of wadding, the paste being allowed to remain on the parts for two hours or longer, according as the color is to be lighter or darker. After this time the paste applied is removed by means of a stick (for it colors the fingers black), the horn is washed off and left for 8 to 10 hours. Finally, it is polished with soft soap and Vienna lime. The natural appearance is obtained with a little practice.

*Cows' Horns, Polishing.*—Rasp the horn with a file until the surface is smooth; then scrape with glass until there is a fine, clean surface. Rub with a cloth and putty powder, wet to a paste with water. Polish with a cloth and oxide of tin, wet with water to a paste.

*Handles for razors, knives, and similar works, when molded, are scraped, and then buffed with fine sand and oil, and*

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afterward with rotten stone and oil, as more fully explained under the head "Tortoise Shell;" but upon which latter material the sand is not used in its natural state, as it would be too coarse and vigorous in its action on that soft and expensive substance; for buffing tortoise shell, therefore, the sand is first calcined and pounded, and then passed through a muslin sieve. (See Tortoiseshell.)

**Staining Horn.**—1.—After having fine sandpapered the horns, dissolve 50 to 60 grams of nitrate of silver in 1 oz. of distilled water. It will be colorless. Dip a small brush in, and paint the horns where they are to be black. When dry, put them where the sun can shine on them, and you will find that they will turn jet black. When done, polish off.

2.—By boiling well in infusions of various colored ingredients, and is done to imitate tortoise shell. Mix together pearl-ash, quicklime and litharge with a sufficient quantity of water, and a little pounded dragon's blood, and boil them together for ½ hour; apply this hot. For black—iron, iron filings, copperas, with vinegar applied on this.

3.—Black.—a.—Burned lime, 5.5 lb., are slaked in a little water, so that a powdery hydrate of lime is obtained; this is mixed with 2.2 lb. of minium, and this mixture is formed into a thick paste with such lye as soap boilers use, having a specific weight of 1.036. The articles of horn are placed in this solution for 24 hours; they are then taken out, rinsed off with water, dried with a cloth, brushed over with rape-seed oil, and then again rubbed dry.

b.—Dissolve 0.1 oz. of silver in 2.1 oz. of nitric acid (aqua fortis), and this solution is applied several times to the article to be stained, but it is absolutely necessary that the first coat should be entirely dry before another is applied. The articles are then burnished and made bright.

4.—Blue.—Stain green, and then steep for a short time in a weak solution of sulphate of indigo, containing a little cream of tartar.

5.—Brown.—Immerse in aqueous solution of potassium ferrocyanide, dry, and treat with a hot dilute solution of copper sulphate.

6.—Green.—a.—Dissolve 0.52 oz. of fine indigo carmine in 2.1 oz. of rain water. Then 0.175 oz. of pure picric acid are dissolved in 2.1 oz. of boiling-hot rain water, and both solutions are mixed together. A very beautiful, durable green color will in this manner be

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obtained, and can be used for the various manipulations.

b.—Aniline green, 0.35. Dissolve in 4.2 oz. of 90% alcohol, and the horn to be stained is treated with this solution. All the different shades of green may be produced by adding blue or yellow stain.

c.—Copper, 4.2 oz. Cut up finely, and gradually dissolved in 13 oz. of nitric acid (aqua fortis), and the articles to be stained in this solution until they have assumed a fine green color.

d.—Steep in a solution of 2 parts of verdigris and 1 part of sal ammoniac.

7.—Purple.—a.—Logwood, 17.5 oz., are boiled in 4.4 lb. of milk of lime, and the same method is observed as given in red.

b.—Use a strong aqueous solution of gold chloride.

8.—Red.—a.—Red Brazil wood, 17.5 oz., are boiled for 1 hour in 4.4 lb. of milk of lime, and filtered through a cloth. The articles of horn, ivory or bone to be stained are boiled for 1 hour in a solution of 1.05 oz. of alum in 17.5 oz. of water. They are then placed in the above stain, and allowed to remain there until the desired color has been produced. Articles stained in this manner will acquire a beautiful purple color by dipping them in alum water.

b.—Soak in very dilute nitric acid for a few minutes and apply a strong infusion of cochineal in aqua ammonia.

c.—Bright Red.—Logwood, 8.75 oz., and red Brazil wood, 8.75 oz., are boiled in 4.4 lb. of milk of lime. It is applied in the same manner as 1.

d.—Tortoise Shell.—A rough dough is prepared from 17.5 oz. of white litharge, 2.2 lb. of finely powdered unslaked lime, 3.3 lb. of soap boilers' lye, having a specific weight of 1.036. The places on the horn which are to become dark are covered with this dough, and the horn is allowed to remain in contact with the dough for about 24 hours, until the latter has become entirely dry. The horn is then cleansed with a brush.

e.—Yellow.—Alum, 17.5 oz., free from iron, are dissolved in 4.4 lb. of rain water. The articles are allowed to lie in this for 1 or 2 hours. In the meantime 7 oz. of yellow berries are boiled with 4.2 oz. of carbonate of potash in 2.2 lb. of water for 1 hour, and then strained. The articles stained with alum are placed in this decoction, and allowed to lie in it for one hour. They are then taken out and dried.

f.—Steep them in a solution of lead acetate, and then, after drying, in a solution of bichromate of potash.

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*Polishing Horn and Bone.*—1.—Use finely ground pumice stone and water, applied with a felt polishing wheel; finish with rotten stone applied in the same way.

2.—Having scraped the work perfectly smooth and level, rub it with very fine sandpaper, repeat the rubbing with a bit of felt dipped in finely powdered charcoal with water, and lastly with rotten stone or putty powder, and finish with a piece of soft wash leather dampened with a little sweet oil; or, still better, rub it with subnitrate of bismuth by the palm of the hand.

3.—First scrape off the glass to take off any roughness, then grind some pumice stone to powder, and with a piece of cloth, wetted, and dipped in the powder, rub them until a smooth face is obtained. Next polish with rotten stone and linseed oil, and finish with dry flour and a piece of clean linen rag. The more rubbing with the stone and oil the better the polish. It is a very fine and sharp sand, and is prepared for use by calcining and sifting.

*Softening Horn.*—The bony core of the horn is first removed; the next process is to cut off with a saw the tip of the horn; that is, the whole of its solid part, which is used by cutlers for knife handles and sundry other purposes. The remainder of the horn is left entire, or is sawn across into lengths, according to the use to which it is destined. Next, it is immersed in boiling water for half an hour, by which it is softened, and while still hot is held in the flame of a coal or wood fire, taking care to bring the inside as well as the outside of the horn, if from an old animal, in contact with the blaze. It is kept there till it acquires the temperature of molten lead, or thereabout, and in consequence becomes very soft. In this state it is slit lengthwise by a strong pointed knife, like a pruning knife, and by means of two pairs of pincers, applied one to each edge of the slit, the cylinder is opened nearly flat. The degree of compression is regulated by the use to which the horn is afterward to be put. When it is intended for leaves of lanterns, the pressure is to be sufficiently strong (in the language of the workmen) to break the grain, by which is meant separating in a slight degree the laminae of which it is composed, so as to allow the round-pointed knife to be introduced between them, in order to effect a complete separation. For combs, the plates of horn should be pressed as little as possible, so that the teeth may not

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split at the points. They are shaped chiefly by means of rasps and scrapers of various forms, after having been roughed out by a hatchet or saw; the teeth are cut by a double saw fixed in a back, the two plates being set to different depths, so that the first cuts the teeth only half way down, and is followed by the other, which cuts the whole length; the teeth are then finished and pointed by triangular rasps. Horn for knife handles is sawn into blanks, slit, pared and partially shaped, then heated in water and pressed between dies. It is afterward scraped, buffed and polished.

*Waste Mass.*—The horn chips are laid in a fluid consisting of a cold saturated solution of boracic acid in water and a cold saturated solution of arsenic acid in dilute hydrochloric acid (sp. gr. 1). After working for a time, the mass is heated in a water bath for a short period to about 140° F. The horn substance is then transferred to closed iron molds, which, by means of a suitable heating arrangement, are heated to about 218° F., and by means of a piston, working in the mold, subjected to heavy pressure until all the fluid is removed. When the mass, thus pressed, has been allowed to cool, the horn chips will be found transformed into a solid mass, which can be worked like the ordinary horn substance.

*Welding Horn.*—Pieces of horn may be joined by heating the edges until they are quite soft, and pressing them together until they are cold. (See also *Bone*;

*Ivory.*)

*Ivory.*

*Bleaching.*—1.—Ivory that has become yellow by exposure can be whitened by washing in a solution composed of 1 oz. of nitric acid and 10 oz. of soft water; apply with a rough brush; cleanse thoroughly in clean water.

2.—Rub the ivory with fine pumice and water, and, while damp, expose it to the sun under a glass vessel.

3.—Peroxide of hydrogen is used in Sheffield to bleach the inferior ivory for knife handles. The mode of procedure is as follows: Place, say, 2 qt. of the liquid in a stone pot, adding 4 oz. of liquor ammon. fort.; immerse the handle, and put over a common shop stove for 24 to 36 hours; the handles are then taken out and gradually dried in the air, not too quickly, or they would split. The deep color of the ivory is removed, and a beautiful pearly white results when polished. The ivory is previously treated

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with a solution of common soda, to get rid of greasy matter, and open the pores.

4.—Take 2 handfuls of lime, slake it by sprinkling it with water; then add 3 pt. of water, and stir the whole together; let it settle 10 minutes, and pour the water into a pan for your purpose. Then take your ivory and steep it in the limewater for 24 hours, after which boil it in a strong alum water for 1 hour, and dry it in the air.

5.—Slake some lime in water; put your ivory in that water, after being decanted from the grounds, and boil it till it looks quite white. To polish it afterward, set it in the turner's wheel; and, after having worked, take rushes and pumice stone, subtle powder, with water, and rub it till it looks perfectly smooth. Next to that, heat it by turning it against a piece of linen or sheepskin leather, and, when hot, rub it over with a little whiting diluted in oil of olive; then with a little dry whiting alone; finally with a piece of soft white rag. When all this is performed as directed the ivory will look very white.

*Cement for Ivory.* (See CEMENTS.)

*Cleansing Ivory.*—1.—Removing Grain Marks.—Scrape the ivory, being careful to keep to the original contour. A plan adopted with valuable pieces is to engrave a design on the surface, and to fill with black ink, made by dissolving sealing wax with spirit. Leave this to set, then polish off, thus hiding the objectionable marks.

2.—Grease Stains.—Soak the ivory in best turpentine, letting it remain for a night and a day, and then rub off with whiting. This will bleach the ivory and remove the stains. Be careful not to allow the turpentine to soak into the joints of the article.

*Dyeing.*—L. Müller finds that objects of this material may be stained by boiling them for a long time in a perfectly clear solution of the desired coloring matter. Aniline red, picric acid or potassium dichromate, iodine green, sumac, aniline dyes, etc., may be used conveniently. The ivory must be thoroughly clean. It may be bleached by immersion for several hours in a solution of permanganate, and then in sulphurous acid.

*Black for Ivory or Bone.*—1.—Water, 1 gal.; logwood, 1 lb.; acetate of iron, ½ lb. Soak the articles in this until the color penetrates deeply by boiling in.

2.—Dissolve lunar caustic (nitrate of silver) in water to a strong solution, and steep your articles in the solution for 4 or 5 hours, and afterward develop the

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color by exposing to the sunlight. A pair of wooden tongs should be used to lift the articles out of the dye vat or bath, as the solution is injurious to the hands.

3.—If the ivory is well washed in an alkaline lye, and is then laid for several hours in a dilute solution of neutral nitrate of pure silver, with access of light, it will assume a black color, having a slightly green cast.

4.—A still finer black may be obtained by boiling the ivory for some time in a strained decoction of logwood, and then steeping it in a solution of red sulphate or red acetate of iron.

5.—Immerse frequently in common black ink.

6.—Steep for 2 or 3 days in a decoction made with 1 lb. of galls and 2 lb. of logwood, then steep for a few hours in iron liquor (acetate of iron).

7.—The pieces are always first polished with whiting and water, and when washed quite clean from the whiting are then prepared for the stain by a short immersion of from 3 to 5 minutes in acidulated cold water, in the proportion of 1 part of muriatic acid, the ordinary acid of commerce, to 40 or 50 parts of water, or in an equally weak solution of nitric acid. This cleansing fluid extracts the gelatine from the surface of the ivory, and is essential to the attainment of a perfectly uniform color. Extreme cleanliness, and the absence of any grease or accidental soiling are as necessary, with which view the work in process of staining is at no time touched by the fingers, but is removed from one vessel to another by flat pieces of wood attached to each other at one end by a flat metal spring, after the form of a pair of sugar tongs, separate pairs being kept for different colors. Subsequently to its treatment with the acid the ivory is invariably again placed in cold water that has been boiled, before it is transferred to the stain. Logwood stain is: Make a decoction of 2 oz. of logwood dust in 1 qt. of water, and strain; dissolve 1 oz. of sulphate of iron in 1 qt. of water, then heat the two stains in separate vessels, to 100° F., and immerse the ivory in the logwood stain for 15 minutes; well wash, and then place it for 5 minutes in the sulphate of iron stain.

8.—Finely powdered gall nuts, 1 part; pulverized verdigris, 4 parts, boiled in water, 30 parts by weight, the fluid to be strained, and again brought to boiling. The ivory to be immersed in it, and afterward placed in the following bath: Campeachy wood extract, 1 part (tied



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in a linen bag); acetate of iron, 0.5 part; gum arabic, 0.1 part; water, 12 parts; alum, 1-12 part; boiled for 1 hour, and strained.

Blue for Ivory or Bone.—1.—Boil together, sulphate of indigo,  $\frac{1}{2}$  oz.; potash,  $\frac{1}{4}$  oz.; water, 2 qt.; and steep the goods in the decoction until of a deep blue.

2.—Sulphate of copper, 1 lb.; water, 2 qt. Boil together, and steep your articles in the liquor, in a boiling heat.

3.—a.—Stain them green, then steep them in a hot and strong solution of pearlash.

b.—Boil them in a strong decoction of logwood, and afterward steep them in a solution of blue vitriol.

c.—Steep them for a short time in a weak solution of sulphate of indigo to which a little salt of tartar has been added; or, still better, boil them in a dyer's green indigo vat.

4.—Immerse for a short time in a dilute solution of indigo carmine.

5.—Brown.—Apply several coats of an ammoniacal solution of potassium permanganate. Similar results are obtained if the solution is diluted with vinegar, and the ivory article allowed to remain in the liquid for some time.

Gray Stain.—Lay the parts in a solution of 1 part of pyrogallic acid in 20 parts of water, for about 20 minutes; allow them to dry thoroughly, then immerse in a solution of 1 part of green vitriol in 25 parts of water.

Green for Ivory or Bone.—1.—Vinegar, 1 qt.; verdigris, 1 oz. Dissolve together, and then boil your articles in it until of the desired hue. The vessel in which the operation is made must not afterward be used for any household purpose, for the dye is highly poisonous, and liable to penetrate any vessel in which it has been made or put.

2.—Steep in a solution of 2 parts of verdigris and 1 part of sal ammoniac. Observe not to use a metallic vessel for the above.

3.—Dip blued ivory for a little while in a solution of nitro-muriate of tin, and then in a hot decoction of fustic.

4.—Boil in a solution of verdigris, in vinegar, until dark enough.

5.—Steep in a solution of verdigris to which a little nitric acid has been added, or in a solution of distilled verdigris in acetic acid.

6.—Green.—Dye yellow first, and afterward dip into a solution of indigo carmine.

Purple.—1.—Make a solution of sal

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ammoniac into 4 times its weight of nitrous oxide. Soak the ivory in this.

2.—Steep in a weak solution of tetrachloride of gold. Boil for 6 hours in a decoction of 1 lb. of logwood in  $\frac{1}{2}$  gal. of water, adding more water as it wastes by boiling, then add 2 oz. of alum, and boil for 1 hour more.

Red Ivory.—1.—Steep in good red writing ink, if not intended to be afterward used in water, or to be washed.

2.—This red, if to be used on an article liable to contact with water, needs to be applied upon a mordant, or fixer, made as follows: Aquafortis, 2 oz.; sal ammoniac,  $\frac{1}{4}$  oz. Mix. Then add tin, in powder,  $\frac{1}{4}$  oz.; water, 1 oz. When all are dissolved, steep the ivory or bone articles in the liquor, and allow them to dry. Afterward boil Brazil wood,  $\frac{1}{2}$  lb.; water, 1 gal.; and again steep your articles in it when at boiling heat.

3.—Red.—a.—Make an infusion of cochineal in water of ammonia, then immerse the pieces therein, having previously soaked them for a few minutes in very weak nitric acid and water.

b.—Boil the bones with 1 lb. of Brazil dust in 1 gal. of water for 3 hours, then add  $\frac{1}{4}$  lb. of alum, and boil for 1 hour more.

4.—Boil Brazil wood chips in weak alum water, and filter. The ivory should be previously treated with dilute muriate of tin solution.

5.—Alum, 2 parts, dissolved in water, 25 parts; then the ivory is treated with a Brazil wood decoction.

6.—Solution of 4 parts of cochineal, 4 parts of cream of tartar, 12 parts of tin solution (finely powdered cochineal to be dissolved in warm tin solution and cream of tartar added). After solution is effected, spirit of sal ammoniac is added, drop by drop.

7.—Macerate cochineal in vinegar, and boil in the liquid for a few minutes.

8.—For red, dip the articles first in a tin mordant, and then into a hot decoction of Brazil wood or cochineal.

Scarlet for Ivory or Bone.—Proceed as in the red, but use solution of lac dye instead of Brazil wood.

Violet for Ivory or Bone.—1.—Tin, in powder,  $\frac{1}{4}$  oz.; sal ammoniac,  $\frac{1}{4}$  oz.; nitric acid, 2 oz.; water, 1 oz. Dissolve all completely, and then steep your ivory or bone in the liquor, taking care not to let it touch your hands, or it will produce painful sores and discoloration. Also avoid breathing the gas evolved from the liquor. After dipping in the above,

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steep the articles in a decoction of logwood.

2.—Dip in the tin mordant and immerse in a decoction of logwood.

3.—Dye red first, then immerse for an instant in a solution of indigo carmine.

4.—Immerse for about 15 minutes in a solution of potassium chromate.

5.—For yellow, impregnate with nitro-hydrochlorate of tin, and then digest in a strong decoction of fustic. The coal-tar colors are now generally used for this and similar purposes.

6.—Finely powdered circuma root, 60 parts; digested in 500 parts of 80% alcohol for a day, and filtered through blotting paper.

7.—Aniline yellow, 95 parts, dissolved in 750 parts of 80% alcohol, and filtered through blotting paper.

*Etching Ivory.*—1.—Take dilute sulphuric acid, dilute muriatic acid, equal parts; mix. For etching varnish, take white wax, 2 parts; tears of mastic, 2 parts; mix.

2.—Etching ground, white wax, 66 parts; mastic, 66 parts; asphalt, 2 parts; melted together. The design must be drawn with a graving needle. Etching fluid: Pure silver, 2 parts, dissolved in nitric acid, 33 1-3 parts, and diluted with distilled water, 750 parts. After etching, wash repeatedly in distilled water. After a few hours, wash out with oil of turpentine and carefully dry; the drawing will be black. For brown drawing, in place of the silver solution use a solution of 1 part of permanganate of potash in 16 parts of distilled water. The ivory must be absolutely free from fat.

*Flexible Ivory.*—Immerse the ivory in a solution of pure phosphoric acid, sp. gr. 1.13, until it partially loses its opacity; then wash in cold soft water, and dry. This renders ivory very flexible, but it regains its hardness if long exposed to dry air. Its pliability may, however, be restored by immersion in hot water.

*Gilding Ivory.*—1.—Put the ivory into a solution of sulphate of iron (copperas), and then into a solution of nitro-muriate of gold; on withdrawing it from the latter it will be beautifully gilded.

2.—The pattern (ornamentation) is traced with a fine camel's-hair brush, moistened with chloride of gold. Then the glass or ivory is held over the mouth of a flask in which hydrogen gas is in process of generation (by the action of dilute sulphuric acid on zinc waste). The hydrogen reduces the chloride of gold on the painted places to metallic gold, and

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the metallic film of gold thus deposited will soon develop quite a shine or glitter. The gold film is very thin.

3.—Ivory is not so easy to gild as articles made of wood; wood, being porous, retains a portion of the gold size; yet, on the other hand, bone or ivory may be so gilt that it shall resemble gold. Free the ivory from dirt or grease; when quite dry, give the article a thin coat of gold size laid on evenly with a fine hair brush; lay aside until set, which may be known by feeling whether tacky to the finger. The gold size should be just the least warm; the article may, with advantage, be warmed before applying the gold size; great care must be used to keep the dust from the article until gilt and quite dry. Cut the gold leaf in suitably sized pieces, and apply with the tip; the gold leaf may then be pressed into shape with a piece of white wool. Should any part appear not gilt, apply a dab of gild size, then a piece of gold leaf. When quite dry, it may be burnished with an ivory paper-knife, or even a glass pen-holder, always inserting a piece of tissue paper between the burnished and the article that is gilt. When finished off, the appearance will be much improved by giving the article a coat of gild lacquer.

4.—Immerse it in a solution of nitro-muriate of gold, and then expose it to hydrogen gas while damp. Wash it afterwards in clean water.

*Hardening Ivory.*—To harden ivory after it has been softened, wrap in a sheet of white paper, cover with dry, deprecitated salt, let it remain for 24 hours, when it will be restored to its original hardness.

*Imitation of Ivory.*—1.—The composition for making imitation ivory is as follows: Powder very finely some egg shell. Make isinglass and brandy into a paste with the egg shell. Color it as desired. The mold must be oiled, and the paste poured in warm. When dry it is ready for use.

2.—One of the disadvantages of celluloid is the fact that it burns very readily when a flame is applied; but a new compound, said to be fireproof, and suitable as a substitute for ivory, is thus made: A solution is prepared of 200 parts of casein in 50 parts of ammonia and 400 of water, or 150 parts of albumen in 400 of water. To the solution the following are added: Quicklime, 240 parts; acetate of alumina, 150 parts; alum, 50 parts; sulphate of lime, 1,200 parts; oil, 100 parts. The oil is to be mixed in last. When dark objects are to be made, from

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75 to 100 parts of tannin are to be substituted for the acetate of alumina. When the mixture has been well kneaded together, and made into a smooth paste, it is passed through rollers to form plates of the desired shape. These are dried and pressed into metallic molds previously heated, or they may be reduced to a very fine powder, which is introduced into heated molds and submitted to a strong pressure. The objects are afterward dipped into the following bath: Water, 100 parts; white glue, 1 part; phosphoric acid, 10 parts. Finally, they are dried, polished, and varnished with shellac.

### Miniature Painting, Preparation for.

It is usual to paint miniatures upon ivory which is sold prepared for the purpose by the artist's colorman, after being subjected to a bleaching process by boiling, or exposure to the rays of the sun; but the bleaching can be more expeditiously performed by placing the ivory before a good fire, which will dispel the wavy lines, if they are not very strongly marked, that frequently destroy the requisite uniformity of surface. Ivory of the best quality has but few of these wavy lines, but it is frequently expedient to employ that of inferior quality.

**Mounting.**—The ivory should be fastened at the four corners to a piece of cardboard for the convenience of painting on; the back of the ivory should be kept perfectly clean, as any application of gum or glue to its surface destroys the transparent quality upon which its usefulness depends. After the surface to be painted on is properly cleaned, it should on no account be touched with the fingers, as the employment of oxgall to remove greasiness must be scrupulously avoided. An ivory palette is best adapted for miniature painting, because the tints appear on it the same as when worked on the miniature, a matter of considerable importance.

**Polishing Ivory.**—1.—This may be done by hard, medium, and soft revolving brushes with wet whiting and water, finishing with a soft polishing bob charged with dry whiting or with putty powder.

2.—To polish ivory by hand, make a pad of thick flannel or blanketing and rub with whiting and water; finish with a new pad and dry whiting or putty powder. When finished, stand in the sun to bleach, if desired.

3.—The following directions apply to the cleaning and polishing of an ivory tusk, the surface of which is somewhat corroded. With a blunt knife first scrape

(Ivory)

away the scaly matter until the ivory below begins to show up all over. Then scrape with pieces of broken glass, using the sharp edges, or a steel wood scraper. Continue this operation until all protuberances are worn down and the entire surface is moderately smooth. Next use coarse glasspaper, followed by medium, and then fine. Now rub well with fine emery powder, moistened into a paste with lard oil. Follow this application with one of powdered pumice and oil for a considerable time until a polish begins to appear. Finally, a vigorous friction with putty powder and the palm of the hand will complete the operation.

4.—The modes of polishing objects made of this useful and ornamental substance, differ according to the nature of the works; and although the following directions offered refer especially to the ivory of the elephant, that of the tusks of other animals, also the corosos, or vegetable ivory, and bone are treated nearly or quite the same, when applied to similar uses. Turned works with plain surfaces may in general be left so smooth from the tool as to require but *very little* polishing, a point always aimed at, with superior workmen, by the employment of sharp tools. In the polishing of turned works, very fine glasspaper or emery paper is first used, and it is rendered still finer and smoother by rubbing two pieces together face to face; secondly, whiting and water as thick as cream is then applied on wash leather, linen or cotton rag, which should be thin, that the fingers may the more readily feel and avoid the keen fillets and edges of the ivory work, that would be rounded by excessive polishing; thirdly, when the work feels smooth, or to hang less to the rag than at first, the work is washed with clean water on the same or another rag; fourthly, it is rubbed with a clean dry cloth until all the moisture is absorbed, and lastly, a very minute quantity of oil or tallow is put on the rag to give a gloss. Scarcely any of the oil remains behind, and the apprehension of its being absorbed by the ivory and disposing it to turn yellow may be discarded; indeed, the quantity of oil used is quite insignificant, and its main purpose is to keep the surface of the ivory slightly lubricated, so that the rag may not hang to it and wear it into rings or groovy marks. Putty powder is sometimes used for polishing ivory work, but it is more expensive and scarcely better suited than whiting, which is sufficiently hard for the purpose.

5.—Turned Works consisting of many

(Ivory)

parts are best polished separately, as they are then more accessible, and the whitening and water do not penetrate and clog the joinings of the several parts, and prevent their easy separation. Accurate workmen frequently polish screw threads in order to make them move the more easily, and to endure the longer without wearing loose; this is sometimes done with screws in ivory and the woods, as well as those in the metals, and is to be highly recommended.

6.—Turned Works ornamented with the eccentric chuck, revolving cutters, etc., are also required to be cut with exceedingly sharp tools, in order that but little polishing may be necessary. The polishing of irregular surfaces is generally done with a moderately hard nail brush, supplied with whitening and water, and lightly applied in all directions, to penetrate every interstice; after a period, the work is brushed with plain water and a clean brush, to remove every vestige of the whitening. The ivory is dried by wiping and pressing it with a clean linen or cotton rag, and is afterwards allowed to dry in the air, or at a good distance from the fire; when dry, a gloss is given with a clean brush, on which a minute drop of oil is first applied. It is better to do too little polishing at first, so as to need a repetition of the process, rather than, by injudicious activity, to round and obliterate all the delicate points and edges of the works, upon the preservation of which their beauty mainly depends.

7.—Superior Flat Works are accurately filed and scraped, then cleaned with fine glasspaper folded around a square stick, afterwards with whitening also on a stick of deal, planed very flat and square and used as a file; some workmen cover the wood with one or two layers of flannel or cloth, but the naked wood, although somewhat tedious, will produce more exact surfaces and better defined edges.

8.—Common Filed and Carved Works are finished—first, with Trent sand and water on flannel or a brush; secondly, scraped Flanders brick, used in like manner; thirdly, wet linen or woolen rag, with powdered chalk, which soon rubs down smooth, and to the condition of ordinary whitening.

9.—Razors and Knife Handles are most generally finished by shaving or scraping; and secondly, by buffing them on the wheels, as more fully explained under the head Tortoise-shell; but the following methods are by some preferred.

10.—Common Razor Handles.—These are sawn out and filed, then scraped with

(Ivory)

an old razor blade called a shaving blade; two razor handles or scales are then held at the one end in a pair of clamps in the vise, and rubbed lengthwise; first, with chalk and water on felt or cloth, which cuts very quickly; and secondly, with whitening and water for the finish.

11.—Best Razor Handles.—Two scales are slightly riveted together and buffed; first, on a buff-wheel fed with Trent sand; secondly, buffed with rotten stone; thirdly, they are handed up or polished with the naked hand and rotten stone. Other workmen entirely omit the rotten stone, which requires oil, and conduct the work with chalk and whitening, so that water may be used throughout the work.

12.—Umbrella and Parasol Handles, and many similar pieces, are polished first with sand and then with whitening, on cloth wheels consisting of several circles of thick cloth or felt, clamped between two smaller disks of wood; the cloth projects about an inch around the margin to make a soft elastic edge.

*Polishing in the Lathe.*—Ivory and fine hard woods may be polished in a turning lathe by mixing with tripoli the dust and shavings that turn off, and pressing it against the work while turning.

*Silvering Ivory.*—1.—Take a small piece of nitrate of silver, and pound it in a mortar. Add some soft water to it, mix thoroughly and put in a bottle. Place the ivory article to be silvered in this solution, allow it to remain until it is of a deep yellow color. Put it then in clear water, and place in the sun. If desired to draw any figure or name upon the ivory, it may be done with a camel's-hair pencil, dipped in the solution. Wash well with water after the drawing has become a deep yellow, and put in the sunlight, occasionally wetting with clean water. Rub it after it has turned a deep black color, and it will change to a brilliant silver.

2.—Make a weak solution of nitrate of silver, immerse the ivory in it, and allow it to remain until the solution gives it a deep yellow color. Immerse in clear water, and expose it in the water to the sun. It becomes black in about three hours. The black surface becomes brilliant silver by rubbing.

*Softening Ivory.*—1.—In 3 oz. of spirits of niter, and 15 of water, mixed, put the ivory and leave for 3 or 4 days.

2.—To Make Ivory Soft and Flexible.—Take a solution of phosphoric acid of 1.130 sp. gr. Put the ivory in this solution, and let it remain until it has a

## Lapidary Arts

### (Lapis Lazuli)

transparent appearance. Take out, wash carefully, dry between soft linen. The ivory will be soft as thick leather. It will become hard if it is exposed to the air, but become soft again if placed in warm water. (See also **Bone**; **Horn**.)

#### Jade.

Polished by lapidaries like carnelian, but it only takes a greasy and not a brilliant polish.

#### Jasper.

Obtains just the same treatment as carnelian in the lapidary's art; it occurs of numerous colors and varieties, and is nearly equal to agate in point of hardness.

#### Jet.

A soft bituminous mineral, and, like cannel coal, receives in the hand of the lapidary the same routine as alabaster. (See also **Cannel Coal**.)

**Working Jet.**—1.—Small chisels of ordinary shape are used in turning jet on a lathe. The action is more of a scrape than a distinct cut. A knife the size of a penknife, with the point beveled off and then set like a chisel, is used in carving jet. Jet is first polished on a revolving wooden wheel with rotten stone and water, and then finished off on a board covered with stont leather—often porpoise hide—impregnated with rouge or lampblack mixed with a very small quantity of oil.

2.—The tools used for turning jet are beveled from both sides like a turner's soft wood chisel, only they are held with the edge horizontal and scrape rather than cut. Their edges are very thin and keen. A small gouge, also beveled from both sides, is used for roughing out. For polishing use first fine emery cloth, then charcoal dust and soft soap on a flannel. Finish with the same, only adding more soft soap. Sometimes rotten stone on the hand or flannel is used as a finish. No heat is required.

#### Lapis Lazuli.

Used in jewelry, but chiefly important as affording that beautiful pigment, ultramarine, so highly valued by painters on account of its great advantage in not changing by time or exposure. Lapis lazuli is difficult to polish on account of the irregularity of its substance, which abounds in soft parts that wear away more quickly than the remainder; it is treated as carnelian.

Lavas, which are occasionally arranged

### (Marble)

as specimens, do not in general admit of being well polished, because of their being irregularly hard and soft, and also scoriaceous; they are worked by the lapidary just like alabaster.

#### Malachite.

Malachite, or the massive green carbonate of copper, is much used for jewelry and articles of *vertu*. The finest malachite is from Russia, and as it is traversed by numerous circular fissures—from the imperfect joinings of the botryoidal masses of which it may be considered to be composed—it is difficult to polish, and requires great care and attention; notwithstanding its hardness, it is considered by some lapidaries better to treat it as alabaster than carnelian, but each method is followed.

#### Marble.

1.—If the piece to be polished is a plane surface, it is first rubbed by means of another piece of marble, or hard stone, with the intervention of water and two sorts of sand; first with the finest river or drift sand, and then with common house or white sand, which latter leaves the surface sufficiently smooth for the process of gritting. Three sorts of grit stone are employed: first, Newcastle grit; second, a fine grit brought from the neighborhood of Leeds; and lastly, a still finer, called snake grit, procured at Ayr, in Scotland. These are rubbed successively on the surface with water alone; by these means, the surface is gradually reduced to closeness of texture, fitting it for the process of glazing, which is performed by means of a wooden block having a thick piece of woolen stuff wound tightly round it; the interstices of the fibers of this are filled with prepared putty powder (peroxide of tin), and moistened with water; this being laid on the marble and loaded, it is drawn up and down the marble by means of a handle, being occasionally wetted, until the desired gloss is produced. The polishing of moldings is done with the same materials, but with rubbers varied in shape according to that of the molding. The block is not used in this case; in its stead a piece of linen cloth is folded to make a handful; this also contains the putty powder and water. Sand rubbers employed to polish a slab of large dimensions should never exceed 2.3 of its length nor 1.3 of its width; but if the piece of marble is small, it may be sanded itself on a larger piece of stone. The grit rubbers are never larger than that

## Lapidary Arts

### (Meerschäum)

they may be easily held in one hand; the largest block is about 14 in. in length and 4½ in. in breadth.

2.—To Polish Imitation Marbles, when you have finished marbling, let the work stand for a day or two; then gently rub it down with the back or smooth side of a sheet of sandpaper; this will take off the knits or bits of skin which may be upon it, without scratching it; now give it three coats of the best pale polishing copal varnish, allowing an interval of two days after each coat. Let this stand for three weeks; then cut it down with ground pumice and water, using a piece of wash leather or rag for that purpose. When you have got it tolerably smooth and level, wash it well with plenty of clean water, taking particular care to clean off all the pumice; give it five coats of varnish. It ought now to stand for three to six months before it is polished, for if it is done before it is almost certain to crack. When the varnish is sufficiently hard, cut it down with finely ground pumice as before; then use rotten stone and olive oil, with the ball of the hand; then flour and oil; finish off with dry flour. This takes a deal of time to do it properly. ●

3.—Pure beeswax, 10 parts; Japan gold size, 2 parts; spirits of turpentine, 88 parts. The mixture is of creamy consistency, and should be applied in small quantities, with the aid of a piece of white flannel. If it is desired for use upon white marble, white wax may be substituted. The same preparation can be used to advantage on woodwork. The Japan size prevents the stickiness which exists when wax alone is used.

### Meerschäum.

Meerschäum is scraped to a smooth surface; but it is so soft as scarcely to admit of being polished, otherwise than by dipping the meerschäum into melted wax to fill up its pores, and rubbing it when dry with a flannel, which is the usual process.

*Mending.*—If the material is genuine (natural) meerschäum you can make a lasting joint between the parts by proceeding as follows: Clean a clove or two of garlic (the fresher the better) by removing all the outside hull or skin; throw into a little mortar, and mash to a paste. Rub this paste over each surface to be united and join quickly. Bring the parts as closely together as possible and fasten in this position. Have ready some boiling fresh milk; place the article in it and continue boiling for 30 minutes. Re-

### (Meerschäum)

move and let cool slowly. If properly done, this makes a joint that will stand any ordinary treatment, and is nearly invisible. If of composition, use a cement made of quicklime, rubbed to a thick cream with egg albumen.

*Pipes.*—1.—Meerschäum is worked in the following way: The large pieces of meerschäum are cut with a band saw to a convenient size, after which the material is soaked in water until it becomes quite soft. When wet it becomes very soapy, and will produce quite a lather if rubbed. After being thoroughly soaked, the meerschäum can be cut like cheese, and it is then roughly shaped with a knife to the form of a pipe. When dry, the bowl and stem shanks are drilled, and then if the pipe is of a plain pattern, it is turned on a lathe to the desired form. If a square stem shank is desired, it is shaped with a file. The shank is now shouldered and threaded to receive the amber stem piece.

2.—*Cleaning.*—A very simple and effective way of cleaning the inside of a pipe is to plug up the bowl with a cork in which a hole has been bored. Fit the cork against the water tap and turn on the water. To clean the outside of the pipe, make a thick paste of whiting and turpentine, and brush it over with a hard brush. Leave the paste pretty thick on the pipe and allow it to become quite dry, when it should be brushed off with a clean hard brush. Finish cleaning the pipe by rubbing over with a soft cloth and sweet oil.

3.—*Discoloration, Removing.*—To clean the carving on a meerschäum pipe and remove the black around the top, wash the bowl with hot milk, using a tooth or nail brush to clean the dirt out of the carved portion. For the black part try the effect of very fine pumice powder and benzoline; bring up the gloss again with putty powder and a trace of olive oil. The greater part of the coloring of a meerschäum may be removed by steeping it for some time in moderately strong ammonia solution, 1 part of strong ammonia to 2 parts of water.

4.—*Imitation.*—These are said to be prepared from a mixture of the artificially prepared silicates of magnesia, alumina, and lime, and sulphate of lime; these are mixed together in the state of pastes, dried at the ordinary temperature, cut into small blocks, and dried on a stove. The blocks are then turned in the lathe in a similar manner to real meerschäum. Imitation meerschäum pipes should not be varnished; the varnish will burn or crack

(Meerschauum)

when the pipes are smoked. They may be warmed and rubbed with a little white wax, and then polished with a soft rag. The best way, however, is to polish them with a revolving wooden polishing wheel covered with leather or felt, using dry putty powder or whiting.

5.—*Substitute for Meerschauum (Berto-lio's).*—a.— Make a hot solution of silicate of potash. Place in it carbonate of magnesia, cut in small pieces. Let the pieces remain in the solution a few days, and then dry. Repeat several times, using fresh hot solution of water glass instead of silicate of potash. Expose the pieces to the air for a few months. In 6 or 7 months the pieces are hard enough to be worked, and closely resemble meerschauum.

b.—Make a solution of 4 parts of sulphuric acid in 50 parts of water. Treat peeled potatoes with this solution for 36 hours. Dry the mass between blotting paper and press. Pipes may be made of this material which closely resemble meerschauum. By using very strong pressure, billiard balls have been made, closely resembling ivory. The material can be carved.

6.—*Rewaxing.*—Carefully clean the pipe by rubbing all over with soft rag wetted with methylated spirit and dipped in pumice powder, finishing with clean, soft rag. To rewx, place a small spirit lamp beneath the pipe, but near enough to the pipe to keep it sufficiently warm to melt a piece of white wax held against it. Let the wax touch those parts only which are intended to be colored, and when the pipe is cold, wipe off the superfluous wax with a soft rag. Pipes can also be rewxed by merely making them hot enough with smoking to melt the wax. Any coloring wrongly placed can be removed by dipping the bowl to the required depth in chloroform. Rewaxing demands care and patience. Another method is to cut 1 lb. of white castile soap into thin shavings, boil with 2 pt. of water till dissolved, then add 1 lb. of white beeswax, also in thin shavings, and stir till cold. Well rub this paste into the meerschauum and polish with a silk rag. A harder polish can be obtained by using carnauba wax in place of beeswax, but this is difficult to emulsify with the soap.

*Meerschauum, To Color.*—1.—Ordinarily, the pipe is boiled for coloring in a preparation of wax, which is absorbed, and a thin coating of wax is held on the surface of the pipe, and made to take a high polish. Under the wax is retained the oil of tobacco, which is absorbed by the pipe, and its hue grows darker in

(Mussel Shells)

proportion to the tobacco used. A meerschauum pipe at first should be smoked very slowly, and before a second bowlful is lighted the pipe should cool off. This is to keep the wax as far up on the bowl as possible, and rapid smoking will overheat, driving the wax off and leaving the pipe dry and raw. A new pipe should never be smoked outdoors in extremely cold weather.

2.— Fill the pipe, and smoke down about one-third, or to the height to which you wish to color. Leave the remainder of the tobacco in the pipe, and do not empty or disturb it for several weeks, or until the desired color is obtained. When smoking, put fresh tobacco on the top, and smoke to the same level.

3.—When once burnt, the pipe cannot be satisfactorily colored, unless the burnt portion is removed and the surface again treated by the process by which meerschauum is prepared. The coloring is produced by action of the smoke upon the oils and wax which are superficially on the exterior of the pipe, and are applied in the process of manufacture.

4.—The simplest method of performing this is as follows: Fill the pipe, and smoke down about one-third, or to the height to which you wish to color. Leave the remainder of the tobacco in the pipe, and do not empty or disturb it for several weeks, or until the desired color is obtained. When smoking, put fresh tobacco on the top, and smoke to the same level. Another method is as follows: The pipe is boiled for coloring in a preparation of wax, which is absorbed, and a thin coating of wax is held on the surface of the pipe, and made to take a high polish. Under the wax is retained the oil of tobacco, which is absorbed by the pipe, and its hue grows darker in proportion to the tobacco used. A meerschauum pipe at first should be smoked very slowly, and before a second bowlful is lighted the pipe should cool off. This is to keep the wax as far up on the bowl as possible; rapid smoking will overheat, driving the wax off, and leaving the pipe dry and raw. A new pipe should never be smoked outdoors in extremely cold weather.

Mussel Shells.

*Polishing.*—First rub the shells with the finest emery powder, wet, on a piece of flannel, then polish with oxide of tin or putty powder, and finally with whiting, applied by the ball of the thumb without a cloth. To polish many shells a weak solution of hydrochloric acid has to be

## Lapidary Arts

### (Pearls)

used to remove the rough "skin." The polishing then proceeds as above.

#### Onyx.

A variety of chalcedony that is wrought by the lapidary like Carnelian.

#### Opal.

This beautiful iridescent gem, although soft, is very brittle and tender, on account of the numerous fissures by which it is traversed, and that apparently give rise to the splendid play of colors seen in precious opals of fine quality. Opals are always cut with rounded faces, and are more generally treated like alabaster than carnelian.

#### Pearls and Pearl Working.

For information on pearl, uses of shells, manufacture of buttons, culture pearls, etc., see our Scientific American Supplement, Nos. \*1203, \*1604, 1743, 1385, 1592, \*1700 and \*1786. (\*) Denotes illustrated articles.

*Cleaning.*—1.—For cleaning pearls, one safe method is to wash them in lukewarm water with light suds made from white castile soap, and then to dry them by shaking in a box filled with jewelers' sawdust, for if left wet the gems may be injured.

2.—To free the setting round a pearl from dust, a soft-bristled tooth-brush should be used, for nothing but fine hairs can get into the small corners and clean the prongs without danger of loosening the jewels.

3.—In cleaning a pearl ring or scarf pin surrounded by a cluster of diamonds the best plan is to put the article into a bowl of clear lukewarm water. Next dip the brush in the water, rub it over a pure toilet soap, and make a thin suds on the hand; then brush the jewels and setting carefully until they look clean. Care must be taken that no bits of soap get on the gems. Occasionally they will have to be soaped several times to make them bright. The moment the dirt is removed rinse them in lukewarm water and blow it off quickly, so that the pearl will dry more rapidly when put in the sawdust. Drop them in a bowl filled with jeweler's sawdust and shake them gently for several minutes. When taken out, if any fine particles of wood cling to the setting they should be whisked off with a small, soft, dry tooth-brush, leaving the pearl and diamonds bright and lustrous. Some people prefer using alcohol instead of box sawdust to dry the stones, but unless this is used exceedingly carefully, the setting

### (Pearl Shells)

may be loosened. Dip the ring just once in alcohol and quickly blow or brush it dry. The whole process of cleaning pearls should not take more than from six to ten minutes, and should be done every two or three weeks when they are constantly worn.

*Deterioration.*—Pearls are liable to deterioration from various causes. The acid secretions of the skin, foul gases, salt water and soap injure them, and sudden changes of temperature may cause them to crack or even to burst. In the course of time the pearl becomes dull, or "old," to use the technical term. When it has completely lost its luster it is said to be dead. Attempts have been made to restore the luster of dead pearls by various methods, none of which produces very satisfactory results.

*Glass-gilding. Firing Pearl to Glass.*—First gild the outline, and when quite finished fill the spaces between the lines with very clear varnish. When this becomes tacky, put a little size on the end of the finger, pick up some of the flakes of pearl, and put them on different parts of the letter. Fill in with smaller flakes, and lastly press on some pearl powder to cover the space completely. Apply the varnish with a soft hair-pencil, and to fix the pearl at the back, when the work is quite dry, press a layer of tinfoil well into the breaks. Paint over this with white lead, tinted as may be required, and mixed stiff in boiled oil with enough japan gold size to dry quickly.

*Inlaying on Metal.*—"Pearl-inlaying" is the name given to a process by which pieces of pearl are attached to the surfaces of metal and sometimes of papier maché.

1.—Mother of pearl, known also as pearl oyster and white pearl, is chiefly used for the purpose. It has a clear white surface covered with minute grooves which decompose and reflect the light, imparting a number of beautiful tints.

2.—Aurora shell is used: this has a wrinkled appearance and is known also by its various colors. It is made from the shell of the mollusc known as the sea-ear or ear-shell.

3.—Another pearl used for the purpose comes from the green snail shell; this is distinguished by its glistening shades of green, yellow and pink, blended together.

4.—In preparing the pearl for inlaying, the rough shells are cut with fine saws, the pieces being then ground on both sides on a grindstone until of the requisite thickness. With a pair of ordinary scissors the pearl is now cut into the form



## Lapidary Arts

### Pearl Shells

of leaves, flowers, etc., or when many pieces of the same size and shape are required, a die press operated by foot power may be employed.

5.—Another method by which a number of similar pieces may be obtained consists in cementing the several thicknesses together and, holding the composite lump in a vise, shaping with a fine saw. Files and drills also assist in the shaping. If the cement employed is glue, soaking in water will separate the pieces, from which the glue can then be washed. To prepare the iron or other material to receive the pearl, it should be well cleaned and then coated with lampblack worked up with varnish. When this is thoroughly dry, a coat of black japan is applied, and when this is tacky the pieces of pearl are pressed on with the finger. Being left two or three hours in a hot oven, the japan dries, and then the whole is varnished and again stoved, this process being repeated several times. The varnish should be applied quickly, so as to bring up the surrounding surface to the level of the pearl; the varnish is scraped off the latter with a knife when the stoving operations are finished. The pearl is then polished with pumice stone and water, and the varnish is rubbed smooth with very fine pumice powder moistened with water. The article now has the appearance of being inlaid, if the film of varnish applied is sufficiently thick. It is obvious that the whole process is not one of real inlaying. The next stages of the work can be successfully carried out only by a person possessed of an eye for the artistic. The pieces of pearl are made to assume the forms of flowers, etc., their stem and leaves being sketched in with a camel's-hair pencil dipped in gold size or in a mixture of varnish and turpentine. When tacky, gold leaf is applied, superfluous gold being rubbed off with a piece of silk when the size or varnish is dry. The flowers and leaves are further touched up with paint, and the job is finished by coating with the very best varnish.

*Mother of Pearl.*—Mother of pearl of moderate size may be obtained of dealers. It may be sliced with a circular saw, ground on an ordinary grindstone, then polished with Trent sand, of various degrees of fineness, on a revolving leather buff, and finished with lime or whiting. The slitting and grinding operations are conducted with the saw and stone running in troughs of water. It may also be incised with the graver, fret-sawn (with the addition of water to keep the saw cool),

### Pearl Shells

and shaped with a smooth file, but could hardly be cut with a knife.

1.—*Mother-of-Pearl Gloss on Gelatine Films.*—This is produced, according to the patent of G. A. Poussole, Paris, by mixing an aqueous gelatine solution with ammonium bromide, the product obtained after drying being dipped into a silver nitrate solution. The gelatine is dried again and again dipped, this time in a clear collodion solution; a final drying completes the process.

2.—*Imitation.*—a.—*Imitation of mother of pearl for inlaid work* is obtained by varnishing smooth surface of paper, cardboard, leather, bone, celluloid, etc. When dry, the surface is daubed with colored bronze powder and is subjected to pressure by means of a die having the desired design upon its face, the die being heated to 105° to 150° F. This method is cheap, and the results are durable and can be varied almost indefinitely. Practical working details are missing, however.

b.—Small articles may be made of imitation mother of pearl by producing the articles in horn, which is boiled in a solution of sugar of lead and then laid in very dilute hydrochloric acid.

c.—*Buttons.*—White horn buttons may be made to imitate mother of pearl by being boiled in a saturated solution of sugar of lead and then laid in very dilute hydrochloric acid. Combs, to which the boiling process is not applicable, as it distorts the teeth, may be treated by being kept overnight in a moderately concentrated cold solution of nitrate of lead, then laid for ¼ hour in a bath containing 3 per cent. of nitric acid, finally being rinsed in water. The use of sugar of lead is, however, prejudicial and should be avoided.

3.—*Iridescent.*—The following is said to be the process used in the Vienna shell button works. In a wide-mouth jar large enough to hold the shells, and fitted with a ground glass stopper, put as much ammonia water as will cover the shells. To this add silver chloride in powder until the liquid becomes saturated and a slight excess of the silver salt is established. Into this put the shell and, applying the stopper, set aside in a dark place for a few days. At the end of a week, more or less according to the heat of the weather, density or porosity of the shell, etc., remove the shell and place it, without washing, in the direct sunlight for two or three days. The play of colors is usually established in a few hours, but its permanency is made surer by a little longer exposure to the sun. As a general rule, one week's

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### Pearl Shells

contact with the ammonia water, with two days' exposure to the direct light, are all-sufficient.

To Give to Articles the Luster of Mother of Pearl.—Make a solution of copal, 1 part; sandarac, 1 part; solution of dammar, 2 parts; rosin,  $\frac{1}{2}$  part; absolute alcohol,  $\frac{1}{2}$  part. Mix these ingredients with  $\frac{1}{4}$  their volume of oil of bergamot or rosemary. Distil until it is reduced to the consistency of castor oil. Take a vessel which is a little larger than the article to be coated; fill with water to which has been added about 5% of pure glue solution. Apply the varnish with a feather or brush to the surface of the water; a beautiful iridescent film will be formed, which is laid on the articles to be made iridescent. Keep the water at a temperature of about 70° F.

4.—Polishing.—a.—Take some finely powdered rotten stone and add sufficient olive oil to it to make a thick paste—like the thickest cream. Thin this with sulphuric acid to a thin cream, then apply it with a cork rubber which is covered with selvyt or similar velvet material. When the polish is obtained, wash the surface of the shell with plain water.

b.—In dealing with large numbers of shells a lathe, or grinding spindle, is provided with polishing bobs. These would be for the various stages of grinding level with emery, smoothing with rotten stone and polishing with whiting on buff leather. The polishing materials are moistened to a thin paste with vinegar or dilute sulphuric acid.

c.—Go over it with pumice, finely powdered, washed to separate the impurities and dirt, with which polish it very smooth; then apply putty powder and water by a rubber, which will produce a fine gloss and good color.

d.—Make a thick paste of finely ground rotten stone with olive oil, then add sufficient sulphuric acid to make it a thin cream. When the polish is applied, rub with a cork covered with velvet. When the polish on the shell is obtained, wash the shell well.

Polishing.—1.—Add olive oil to finely pulverized rotten stone, so as to make a thick paste. Then add sulphuric acid in sufficient quantity to make a thin paste. Apply this paste and rub quickly with a cork covered with velvet, and, as soon as the pearl takes the polish wash off. This is a fine polish.

2.—Go over it with pumice stone finely powdered, washed to separate the impurities and dirt, with which polish it very smooth; then apply putty powder and

### (Sapphire)

water by a rubber, which will produce a fine gloss and good color.

Working of Pearl.—There are two kinds of shells used in the manufacture of small articles; the porcelaneous and the nacreous. The former are extremely hard, and can be worked only with the apparatus employed by the lapidary. The latter are more generally used, and may be sawn, filed, and turned, with some facility. The pieces should be roughed out on a common grindstone. After turning, they should be smoothed with pumice stone and water, and polished with rotten stone wet with sulphuric acid slightly diluted.

### Putty, Jewelers'.

1.—Tin putty, an oxide of tin made by levigating the crusts of oxide that form upon the metal when kept for some time in fusion. It is used for polishing.

2.—Melt tin, 1 oz., with an equal weight, or  $1\frac{1}{2}$  oz. of lead, and then raise the heat so as to render the mixed metal red hot, when the tin will be immediately flung out in the state of putty. Both are very hard, used for polishing glass and japan work, and to color opaque white enamel.

### Quartz.

Pure siliceous occurs both crystalline and amorphous, and is polished after the mode described for **Carnelian**. The reader is also referred to the article **Crystal**, by which name quartz is very commonly known in the arts.

### Sapphire.

1.—The previous articles on alabaster and carnelian may with advantage be here referred to, as containing much general information upon the lapidary art; but it should be here observed that the harder and smaller the gems to be wrought, the harder are the metallic laps or mills respectively employed by the lapidary; and although sapphire may, in truth, be entirely wrought by the method employed for carnelian, the present will be found the more usual as well as the more economical practice. As gems are usually retained of as great size as their irregularities of surface will admit, sapphires and many other gems are seldom reduced in size except by grinding, or as it is more commonly called, by *cutting* them. When, however, they are *divided*, it is more commonly done by cleavage or splitting, than by slitting or sawing; which process, when resorted to, is effected nearly as usual with an iron slicer fed with diamond dust, and lubricated with brick oil;

## Lapidary Arts

### (Shells)

the slicer for sapphires is, however, very much smaller than for general lapidary works, and is principally met with in the hands of watch jewelers. Secondly, the lapidary commonly grinds and cuts the facets on sapphires upon a copper lap, supplied with diamond dust and brick oil, which cuts more quickly and delicately than the lead mill with emery; and thirdly, these gems are polished upon a copper lap with rotten stone and water, the tool being jagged, after the manner more fully described under the head **Carnelian**.

2.—Diamond powder is used throughout, and of three degrees of fineness; the coarsest on copper tools, the medium on glass, and the finest on pewter tools for the last polish.

#### Sard.

A variety of chalcedony, that is wrought by the lapidary like **Carnelian**.

#### Serpentine.

When in large pieces, is treated like marble; when the serpentine is in small pieces, that are recent and soft, the lapidary employs much the same mode that he would in grinding and polishing alabaster, or the routine for carnelian, when from exposure to the atmosphere the serpentine has attained its greatest degree of hardness.

#### Shells.

Some of these shells are cut through, to show their internal sections or structures; whilst others are simply polished exteriorly in their entire states, as specimens of natural history, or for their intrinsic beauty. Some few of the shells are cut up in the manufacture of various useful and ornamental works. They are usually treated as follows:

1.—Nacreous Shells, which are generally bivalve shells, such as those of the various oysters, mussels, etc., are thus named from *nacre*, the French for mother of pearl, the covering of the *ostrea margaritifera* of the Indian seas. The nacreous shells are much softer than the porcelaneous, and may be sawn, filed, and turned with moderate facility; but, from the quantity of line they contain, they feel harsh and scratchy under the tools. The pearl shell is much employed in the ornamental art, and the usual course for its preparation into square, angular, and circular plates, and cylindrical pieces, is first, with saws of different and ordinary kinds; the pieces are then roughly shaped on the edge of a grindstone turned into grooves, and afterwards smoothed on the flat side of the stone; many use soap and

### (Shells)

water with the stone, which lessens its liability to become clogged.

2.—Pearl Handles for Razors.—The manufacturers slightly rivet the handles together in pairs, after which they are, first, scraped; secondly, *sand buffed* on the wheel with Trent sand and water; thirdly, *gloss buffed* on the wheel with rotten stone and oil, or sometimes with dry chalk rubbed on the same wheel; and fourthly, they are *handed up* or polished with dry rotten stone and the naked hand.

3.—Pearl Shell, when polished by the lapidary, is treated in the mode followed with **Alabaster**.

4.—Pearl Shell in Detached Pieces, such as counters, silk winders, etc., immediately after having been ground, and when shaped on their edges, are smoothed with Trent sand or pumice stone and water, on a buff-wheel or hand-polisher, and are finished with rotten stone. The latter powder, although sometimes used with oil or water, is more frequently moistened with a little sulphuric acid, nearly or quite undiluted; this produces a far more brilliant polish, which may possibly arise from the partial destruction of the surface, thus developing in a more decided manner the striated formation of the pearl-shell, and to which peculiarity of structure its variegated lustre is ascribed.

5.—Pearl Works Combined, as in Boxes, are most generally reduced to a flat surface by filing and scraping. First, pumice stone and then putty powder are used on buff-sticks with water, and the final polish is given with a buff-stick and rotten stone moistened with sulphuric acid; this mode is available for inlaid works with gold or silver, but not for those having tortoiseshell or other substances that would be attacked by the acid. The buff-stick is expeditious, but for very flat surfaces, a flat deal stick covered with one layer of linen rag is preferable, although slower.

6.—Porcelaneous Shells, which are generally univalve or single shells, such as the whelks, limpets, and cowries, so far resemble porcelain or enamel as not to admit of being otherwise cut than with the apparatus employed by the lapidary; and accordingly, when porcelaneous shells are divided, to exhibit their sections, it is effected by the slicer, with diamond powder. The porcelaneous shells do not, in general, require the coarser or grinding tools, as few of them present the rough coat or epidermis of the nacreous shells; and it is therefore only commonly needful to restore or increase their

## Lapidary Arts

### (Shells)

natural polish with the list or brush wheel of the lapidary. Putty powder may be used, but rotten stone, from its greater hardness, is more effective on porcelaneous shells. Of course, similar wheels running in a vertical plane, such as those of the cutler and workers in horn and ivory, may be also used with equally good effect.

7.—*Shell Cameos*.—A very suitable material for cameos is found in the various conch-shells or *strombs*, the substance of which consists of two distinct layers of different colors, textures, and hardness, and which may be considered respectively to partake of the nature of nacreous and porcelaneous shells. The outer coat or layer in the most suitable specimens of conch-shells is nearly colorless, of uniform texture, and, like that on the nacreous shells, admits of being readily operated upon by steel cutting-tools, and which may be made to produce a smooth and well-finished surface; this outer layer is therefore suited for the carved parts of cameos, the ground being formed of the under layer of the shell, which in the most suitable kinds is of a dark color, and allied to the porcelaneous shells, being somewhat brittle, and so hard and compact as not to admit of being readily cut with steel tools.

8.—*Turned Works* in general only require fine emery paper, and then rotten stone on woollen rag with sulphuric acid, but oil may be used instead of the latter.

*Aquarium Shells, Cleaning*.—It is impossible to keep delicate shells fresh and clean at the bottom of an aquarium. The shells may be cleaned by plunging them in a boiling mixture of 1 part of hydrochloric acid to 10 parts of water. Hold the shells with a pair of wooden tongs, plunge them into the boiling mixture, and let them stay there for one second only. Then place them immediately into clean cold water. Repeat the operation if necessary, but if the shells remain in the acid beyond the prescribed time, they will be eaten in holes, if not altogether dissolved. If the shells are to be replaced in the aquarium, it is not worth while to clean them repeatedly. Introduce a few freshwater snails into the aquarium, and they will keep down the green growth.

*Cleaning and Polishing Shells*.—Shells to be preserved and polished may be roughly divided into three classes: (a) Shells having a natural polish, or requiring very little preparation; (b) those which have no natural polish, but which may be polished without much trouble; (c) rough shells, requiring their rough-

### (Shells)

ness to be removed by mechanical means before they can be polished.

1.—Shells in the first class need very little attention, especially those found in a natural state with a glossy surface, and often of very beautiful variegated hues. Simply cleaning will answer with some of these; with others the colors and polish will not be so bright when dry as in a wet state, but the brightness can easily be restored by brushing over them water in which a little gum arabic has been dissolved; or white of an egg or colorless transparent varnish can be used. The last can of course be washed should the shells get dirty.

2.—With some, the polish and colors may be obscured by a dull epidermis, or outer skin; this must be removed by soaking in warm water, and rubbing it off with a brush or a rag dipped in common hydrochloric acid, afterwards well washing the shells in water, and proceeding as before. But after removing the dull skin, it will be found that most shells will have no natural polish; these constitute the second class. After removing the skin, wash well in warm water and dry in hot sawdust; then a polish may be induced by simply rubbing with chamois leather, or chamois leather and a little olive-oil. Some will probably require to be smoothed down with emery paper, then rubbed with wash-leather dipped in turpentine and dressed with tripoli powder, then with fine tripoli alone, and finally with olive-oil and chamois leather for the finishing touches.

3.—Shells belonging to the third class are the most difficult, and take the longest time to polish; but these will be found to subdivide themselves. Ordinary files, followed by emery cloth, will remove the roughness of some, and they can then be polished in the same way as mentioned for the second class. Others must be ground with wheels of different degrees of fineness, or wooden and other discs dressed with different substances, such as washed emery, rotten stone and water, and leather with putty powder or tripoli. All rough shells should first be boiled in a strong solution of potash. When grinding some shells, the outer stratum or strata may be ground through, so as to show the underlying ones. Grinding shells is by no means an easy operation, and in some cases it may be positively dangerous to the hands, which may be crippled if the work is much indulged in.

*Coloring*.—A little lac dye is boiled and left standing to settle, it is then dissolved in a solution of tin chloride. The shells

Tortoiseshell)

having been well cleaned, are dipped in this until they become the proper color.

**Slate Polishing.**

Slate is faced first with an iron plate with river sand and water, smoothed with pumice stone; then japanned and baked to harden the japan, and again smoothed with pumice stone and polished with rotten stone.

**Tortoiseshell.**

*Combs, Reviving.*—To revive tortoiseshell combs, which often get dull and dingy-looking, dip the finger in linseed oil and rub over the whole surface of the comb. Use but very little oil. If there is a pattern on the comb, it may be necessary to use a soft brush to get it into the crevices. Then rub with the palm of the hand until all oil has disappeared, when the shell feels hot and looks bright and shiny. A very dull comb will need a good deal of rubbing.

*Cutting Tortoiseshell.*—Tortoiseshell may be roughly cut to shape with a fine fret-saw, and trimmed with a fine file or with a sharp knife or graver. Any carving upon it should be done with gravers similar to those used by metal engravers, the cuts being made very shallow owing to the thinness of the material. The original rough surface may be removed with powdered pumice stone and water, and the polishing should be done with dry rouge on a soft rag, the final polish being obtained by rubbing with a soft cloth or velvet pad.

*Polishing.*—1.—The process of polishing depends on whether the entire carapace (shell) or detached plates are to be treated. Too vigorous methods should not be employed in the former instance, or disconnection of the plates from the skeleton will result. General instructions are therefore given as follows: First well wash the shell in warm water and soap powder, and subsequently further cleanse it by means of dilute sulphuric acid,  $\frac{1}{2}$  oz. to 1 pt. of water, removing all traces afterwards by washing. Then proceed to reduce the corrugated surface of each plate by means of the edges of broken glass and coarse, medium, and fine glass-paper, until a perfectly smooth surface is obtained. Powdered pumice should next be rubbed on by means of a soft cloth, and polishing can then be proceeded with. The material used is stannous oxide (putty powder) moistened to a thick paste with lard oil. This is applied continuously with a soft cloth, until a

Tortoiseshell)

polish begins to appear, when the oil may be omitted, and the dry powder used alone until a brilliant polish is obtained. In the final stages, the palm of the hand should be used instead of the cloth, slightly moistening the work by breathing on it.

2.—Handles for razors and penknives, combs, spectacle frames, and many similar works, after they have been sawn out and molded into form, are smoothed with a float or single cut file technically known as a *quannet*, and then shaved or scraped smooth with a scraper like that used by joiners. Cutlers often use an old razor blade, the edge of which has been sharpened at right angles, by placing the blade perpendicularly on the oil-stone. The works are then very sparingly polished on a wheel covered with thick buff leather, such as the bull-neck or seawool, and fed with calcined Trent sand and oil, and they are finished on a similar wheel supplied with rotten stone and oil; occasionally the latter wheel is alone used. Razor handles and some other works are often *handed up*, or finished with the naked hand and dry rotten stone, and works required to be very nice and flat are more generally treated as follows:

3.—Flat Works in Tortoiseshell, such as card and needle cases, and others that require to be kept flat, are floated and scraped as above, successively employing pumice stone, putty powder and rotten stone on three different buff-sticks, and all generally with water, but sometimes with oil, as the treatment varies according to the material inlaid in the tortoiseshell, which is lastly finished with the hand and rotten stone or whiting.

4.—Tortoiseshell, when turned in the lathe, is usually smoothed with fine glass or emery paper, and finished with rotten stone and oil, on linen or woolen rag.

*Welding Tortoiseshell.*—The edges to be united are shaved and scraped to a feather edge, and laid together with a piece of fresh shell upon them; the whole is next subjected to a moist heat (as of hot water), which softens it, and it is then put under great pressure until the parts are united, after which the surplus thickness is removed as waste. Another method of welding tortoiseshell is first to file it clean, and lap one edge over the other, taking care that no grease remains; wet the joint with water and hold it in a hot pair of pincers, so constructed as to cover 4 in. or 5 in. of the joint. Remove the pincers and apply more water and the joint will be found secure. The pincers must not be so hot as to burn the shell.

## CHAPTER XVII

### LEATHIER

#### **Bags, Dressing Cases, etc., To Restore.**

Water, 3 qts.; chip logwood,  $7\frac{1}{2}$  oz.; sugar, 1 oz.; genuine gum arabic, 6 oz.; solution of sulphate of iron; methyl alcohol. Put the water and logwood chips into a copper boiler or saucepan, and let the water boil until reduced one-half in bulk. Then stir in the sugar and gum, and when they are dissolved stir in sufficient of the sulphate of iron solution to cause the reddish brown color of the solution to assume a plum or bluish tint. Then add the alcohol, and after a few days' digestion strain off for use. Apply one or more coats of this solution to the shabby leather with a sponge. If the grain of the leather is very much abraded or rubbed off, a final coat of a spirit gloss or lacquer will restore the new appearance of the bag, or whatever the article may be.

#### **Belting.**

*Dressing.*—As materials for the manufacture of belt dressing, we may enumerate tallow, wax, paraffine, cod liver oil and castor oil. These ingredients must be as free as possible from acid. To deprive tallow and train oil, which usually contain free acid, of acid, we stir into the melted tallow about 5% of soda lye, of about 30° B $\acute{e}$ . After about a quarter of an hour, add about 10% of common salt solution, of 24° B $\acute{e}$ ; stir it in and allow to cool. The free acid combines with the lye, added to form a soap, which is separated by the salt solution. It is allowed to cool and the cake of fat lifted off. By combining the above mentioned substances, we obtain, according to their proportions, a soft or hard preparation. We may choose from the following combinations: Tallow, 10 parts; wax, 7 parts; train oil, 3 parts. The tallow is reduced, and after it is completely dissolved, add the train oil. While it is still fluid pour it into sticks. The molds are best made from tinned steel plate.

*Lacing Belts.*—The ends of a belt should always be cut off square, not

guessed at by the eye, but laid off with a tool. The holes ought to be made with a small punch at a proper distance from the end; the size of the holes and the distances of them depending on the width of the belt. The use of an awl is reprehensible, for the holes are apt to be made irregular by it, and much larger than there is need of. The end of the lace should be tied with a square knot in the middle of the outside, for the corners of the belt where it is cut are most exposed and apt to whip out. Tying a belt lace does not look so neat as where the ends are put through an incision, but tying saves the belt from having extra holes made in it, from end to end, or as nearly so as possible. It often happens that laces have very thin spots in them; such should be kept for short belts, and never used for long ones. Moreover, the holes must be made at equal distances apart and not too many of them. Every hole weakens the belt, and none that are not absolutely essential should be cut. All new laces, as well as new belts, should be stretched by hanging weights on them before they are used; petroleum, sawdust, rosin, and similar substances should never be used. When a belt gets harsh or dry, neat's-foot oil is the best thing to apply to it.

*Preserving.*—A very little pure lard oil or neat's-foot oil will preserve belts and prevent them from cracking. Castor oil and vaseline are also used.

*Slipping of Leather Belts.*—The slipping of belts is a great annoyance, not always remedied by tightening. 1.—When a ready remedy is demanded for a slipping belt, the powder known as whiting, sprinkled sparingly on the inside of the belt, is least harmful of any similar application.

2.—Powdered rosin is bad, as it soon dries the leather and cracks the belt, while it is difficult to get it out of the leather; whereas whiting may be wiped off or washed out with water.

3.—A piece of rubber belting fastened

Always consult the Index when using this book.

## Leather

### (Bookbinders' Leather)

around the belt pulley of an engine will keep the belt from slipping.

4.—Use a piece of beeswax rubbed on the inside of the belt or on the pulleys as a temporary remedy in cases of emergency, though with proper size belts and pulleys, properly put in, there should not ordinarily be any slipping.

*Which Side to Run.*—All the best belt makers say, run grain side to the pulley, and it is claimed that 33% more power can thus be transmitted than with the flesh side next the pulley. The grain of the leather has a velvety surface, which enables it to hug the pulley closer than will the hard flesh side. Some users run the flesh side to the pulley for small belts, and then daub and stick up the belt with beeswax or rosin to make it take hold, but this is not economical for the life of a belt, is unworkmanlike, and there is always more or less fussiness in running machinery where the belts are so treated, instead of their running for years without any attention, as they will sometimes do when run grain side to the pulley, and of proper size to transmit the desired power.

### Bookbinders' Leather or Cloth.

*Cheap Varnish.*—Orange shellac,  $\frac{3}{4}$  lb.; crystallized carbonate of soda, 1 oz.; water, 3 pt. Put the soda into the water and bring the latter to a boil, then put in the shellac and continue the boiling until no more shellac will dissolve, strain the fluid while hot through a cloth or hair sieve, and keep the clear solution for use. The best solvent of shellac, to make an aqueous solution, is ammonia, in the proportion of 1 part of ammonia to 2 parts of shellac and 40 parts of water. Borax is the general agent used, but water will not dissolve more than 4 oz. of shellac per gallon of water. To make a liquid solution a larger proportion of shellac can be dissolved, but the result is a pasty compound.

*Gloss.*—Methyl alcohol, 3 pt.; shellac, orange or ruby, according to color desired,  $1\frac{1}{4}$  lb.; oil of turpentine, 2 fl.oz. Dissolve the shellac by slow digestion in the alcohol, and then add the turpentine.

*Brown Gloss.*—Rectified alcohol,  $5\frac{1}{2}$  pt.; orange shellac,  $17\frac{1}{2}$  oz.; gamboge, powdered, 2 oz.; oil of lavender (avoirdupois weight), 1 oz. Digest the gamboge in the alcohol until the fluid ceases to deepen in color, then dissolve therein the shellac, and when this is dissolved add the oil of lavender.

*Colorless Gloss.*—1.—Methyl alcohol,  $1\frac{1}{2}$  pt.; bleached shellac, 21 oz.; oil of lavender,  $\frac{3}{4}$  fl.oz. Use the freshly

### (Carriage Leather)

bleached shellac. Dissolve this in the alcohol by slow digestion at a gentle heat, and then add the essential oil; the latter ingredient renders the gloss flexible and prevents it being brittle.

2.—Methyl alcohol, 5 pt.; oil of turpentine, 5 pt.; West Indian copal rosin, 5 pt.; mastic rosin, 1 pt. Digest for a few hours separately the mastic in the turpentine and the copal in the alcohol, and then mix the two compounds and gently heat the mixture until the solids are dissolved.

*Flexible Gloss.*—Linseed oil varnish (mangausee linolate), 1 qt.; oil of turpentine,  $\frac{1}{2}$  pt.; benzole,  $\frac{1}{2}$  pt.; rectified alcohol,  $\frac{1}{2}$  pt.; mineral asphaltum, 10 oz.; tar asphaltum, 10 oz.; white wax, 2 oz.; paraffine wax, 3 oz.; American pine rosin, 10 oz.; Paris blue, 2 oz.; methyl violet (magenta), 11 oz. Dissolve the aniline dye (methyl violet) in the alcohol separately. In a suitable vessel melt together the asphaltum, rosin, wax, and paraffine wax. When this is melted stir it well, and then put in the linseed oil and blue pigment. Stand the vessel on a sand bath, and heat until heavy vapor begins to be evolved, stirring it all the time. Sample the compound from time to time by testing how far it can be drawn into thread and leave no fat-like edges when dropped hot on a piece of paper; when this stage is reached, let the compound cool down sufficiently to add the turpentine and benzole safely (if the temperature be too high, this highly inflammable fluid will ignite), and well mix the whole by stirring. This gloss is a very useful one for general purposes, and for use on leather; several coats of it will produce an enamel-like appearance resembling patent leather.

### Bronzing for Leather.

A small amount of so-called insoluble aniline violet is dissolved in a little water, and the solution is brushed over the articles; it will dry quickly, and perhaps may have to be repeated. Shoes that are treated in this way present a beautiful bronze color.

### Carriage Leather.

*Aprons, Dressing for.*—Glue, 2 parts; white soap, 4 parts; yellow wax, 1 part; neat's-foot oil, 1 part; lampblack, q. s. Soften glue, melt over water, dissolve soap in water, q. s., and stir into the glue; add wax in shavings, then oil; lastly, black to color.

*Carriage Top Dressing.*—Carriage tops that have faded and become gray can

## Leather

### (Dyeing)

be restored by washing with a solution composed of: Nutgalls, 4 oz.; logwood, 1 oz.; copperas, 1 oz.; clean iron filings, 1 oz.; sumach berries, 1 oz. Put all but the iron filings and copperas in 1 qt. of the best white wine vinegar, and heat nearly to the boiling point; then add the copperas and iron filings. Let stand for 24 hours, and strain off the liquid; apply with a sponge. This is equally good for restoring black cloth. The top should be washed with warm water and thoroughly dried; then with a sponge give one or two coats of the formula as given above, as may be required by the condition of the top. When dry, apply one coat of lampblack, using oil or varnish enough to give a gloss. Moss off when dry and give a coat of drop black mixed a little quicker than the first coat. Follow up with a little coach japan in it.

**Cements for.** (See CEMENTS.)

### Depilating Hides, Process for.

1.—Make a dilute solution of ammonia and sulphurous acid and place the hides in it. Coat woolly hides on the flesh side with a paste made of potter's clay and the above solution. The salts of ammonia may be used.

2.—Thick skins are allowed to sweat, that is, they are rubbed on the fleshy side with common salt or saturated with wood vinegar and exposed at ordinary or higher temperature to moisture; this causes a slight or more pronounced putrefaction and the hair can then be removed with scraping knives. Thinner skins are placed in pits, with lime or sulphide of sodium; very delicate skins are coated with rusma, sulphate of calcium, or gas lime. Rusma is a salve-like mixture of 1 part of orpiment (yellow sulphide of arsenic) and 2 to 3 parts of lime. The preparation last described is poisonous.

### Dyeing Leather.

**Black.**—1.—Dissolve 1½ oz. solid logwood extract and ¾ oz. solid fustic extract in boiling water, and make up to 35 fl.oz. The leather, which must have been previously cleaned and stretched out, is brushed over five times at 100° F.; 155 gr. of chromate of potash and 77 gr. bluestone are then dissolved in the same quantity of water; the leather is brushed twice with the solution, and then again with the decoction of logwood; 150 gr. of liquid ammonia are then poured into 35 fl.oz. of water, and the leather is gone over with that. To make the leather supple, stir up 150 gr. yolk of egg in 75 gr. of glycerine, make it up with water

### (Dyeing)

to 35 fl.oz., and rub the leather with it. Let it get half dry, and rub with a clean woolen rag.

2.—**Blue Black.**—The following is recommended as a good composition for dyeing leather a blue black: Beeswax, 3 oz.; black rosin, 2 oz.; melt together, and then add Prussian blue, 1 oz.; lampblack, ½ oz. While the mixture is cooling, add turpentine till a suitable consistency is obtained. It should be applied with a soft rag, and the leather afterward polished with a brush.

3.—**Staining Light Leather, Black.**—Simple treatment with solution of iron sulphate or copperas will dye leather black. Acetate of iron may be used instead of above with advantage. The leather may first be mordanted with solution of logwood extract.

**Blue.**—Extract 155 gr. of gallnuts in 35 fl.oz. of water and brush over. Dissolve 155 gr. of soluble aniline blue and 75 gr. of glue in 35 fl.oz. of water. Brush over three times; dry and finish with yolk of egg.

**Brown.**—1.—Extract of fustic, 5 oz.; extract of hypericic, 1 oz.; extract of logwood, ½ oz.; water, 2 gal. Boil all these ingredients for 15 minutes, and then dilute with water to make 10 gal. of dye liquor. Use the dye liquor at a temperature of 110° F. As a Mordant.—Dissolve 3 oz. of white tartar and 4 oz. of alum in 10 gal. of water.

2.—Prepare a dye liquor by dissolving 1½ oz. fast brown in 1 gal. of water, and make a 10 gal. bulk of this. Use at a temperature of 110° F., and employ the same mordanting liquor as in last recipe.

3.—**Bismarck Brown.**—Extract of fustic, 4 oz.; extract of hypericic, 1 oz.; extract of logwood, ½ oz.; water, 2 gal. Preparation.—Boil all together for 15 minutes. Method of Dyeing. First mordant the skins with a mordanting fluid made by dissolving 3 oz. tartar and ½ oz. borax in 10 gal. of water. Then put the skins into the above mordanting bath at a temperature of 100° F. Take them out, and then put in 1 oz. of Bismarck brown, dissolved in boiling water. Put the skins in again until colored deep enough, then lift out, drip and dry.

4.—**Russets, Reds, Yellows.**—a.—The use of russet and brown leather for reins necessitates the employment of stains of various shades in the workshop in order that the reins or other straps may be of a uniform color after being worked. In most cases rein leather is stained by the currier, but when worked the freshly cut edges need to be stained to correspond



## Leather

### (Dyeing)

with the grain. The stains used are generally made of Spanish saffron and annatto, or of saffron alone, made up in various ways, the most common and reliable being the following: Boil a given amount of saffron in water until the color is extracted; cut a quantity of annatto in urine and mix the two together, the proportions of each determining the shade. The more annatto used the darker is the color.

b.—Another manner of preparing this stain is to boil  $\frac{1}{2}$  oz. Spanish saffron and  $\frac{1}{4}$  oz. annatto in water until the dye is extracted, to which must be added some alcohol to set the color.

**Crimson.**—A bright crimson stain is alum or tin salts and a decoction of cochineal.

**Gray.**—Dissolve 155 gr. of tannin in 35 fl.oz. of water, and brush. Dissolve 30 gr. of copperas in 35 fl.oz. of water and brush. If not dark enough, repeat. Dry and rub with rye meal.

**Green.**—1.—1.57 oz. verdigris and 0.52 oz. sal ammoniac are dissolved in 8.75 oz. wine vinegar. If a small quantity of saffron extract is added to this, a yellowish-green color, the so-called parrot-green, is obtained.

2.—If leather is first coated with a solution of Berlin blue, and then with a yellow stain, a beautiful durable green will be obtained.

**Lilac.**—Dissolve 155 gr. of tannin in 35 oz. of water, and brush. Then dissolve 77, 155, or 30 gr. methyl violet, according to shade, in 35 fl.oz. of water, and brush over thrice. Dissolve 155 gr. of glue and the same weight of glycerine in 35 fl.oz. of water, brush and dry.

**Mahogany.**—To stain a sole leather bag somewhat abraded a dark mahogany color: Alkanet root, 15 gr.; aloes, 30 gr.; dragon's blood (all in powder), 30 gr.; 95% alcohol, 500 gr. Moisten the bag with dilute nitric acid (1 part acid to 5 parts water by volume) and then apply above solution. Repeat until dark enough.

**Mode.**—Extract 45 gr. of logwood in 35 fl.oz. of water, and dissolve it in 30 gr. of orchil. Brush the leather with the solution at 110° F. Next dissolve 30 gr. copperas in 35 fl.oz. of water; brush with the solution, and then brush with water. If a reddish tint is desired, dissolve along with the copperas 30 gr. of alum. When dry rub the leather with a woolen rag and rye meal.

**Purple.**—8.75 oz. Brazil wood shavings, or 2.1 oz. scarlet berries, are boiled in 2.2 lb. water in an earthen pot or in a bright copper boiler. The decoction is filtered

### (Furs and Skins)

and compounded with a sufficient quantity of fluid chloride of zinc to obtain either a lighter or a darker color.

**Scarlet.**—Boil 1 lb. of logwood, 8 oz. of Brazil wood, 2 oz. of onion peels, some common salt, and alum, in 4 gal. of water.

**Yellow.**—Most yellow dyes derived from coal-tar produce dark spots on such portions of the grain-side of the leather as have been scratched or scraped. Certain colors, however, prepared by the Berlin Company are free from this defect. Phosphine-orange gives the "brightest" and most intensely yellow of the yellowish-brown shades, commonly termed "almond-yellow." It requires 500 parts of water for solution, and must be boiled till no residue remains. The liquid is then ready for use at once without dilution. If a less fiery shade is wanted, treatment with a solution of bichromate of potash lessens the vividness of the dye.

### Furs and Skins, To Preserve.

1.—The following is Dr. Lettsom's recipe for a mixture found to answer both for animals in cases and skins, in the open air. For birds it is equally good and effective: Corrosive sublimate,  $\frac{1}{4}$  lb.; saltpeter, prepared or burnt,  $\frac{1}{2}$  lb.; alum, burnt,  $\frac{1}{4}$  lb.; flowers of sulphur,  $\frac{1}{2}$  lb.; camphor,  $\frac{1}{4}$  lb.; black pepper, 1 lb.; tobacco, ground coarse, 1 lb. Keep in glass stoppered bottle. Give two or three good rubbings with it.

2.—Swan Skin.—Six oz. arsenic, 3 oz. corrosive sublimate, 2 oz. yellow soap, 1 oz. camphor and  $\frac{1}{2}$  pt. 90% alcohol. Put all these ingredients in a saucepan, which place over a slow fire, stirring the mixture briskly till the several parts are dissolved and form one homogeneous mass. This may be poured into a wide-mouthed bottle, and allowed to stand till quite cold, when it will be ready for use. Of course these quantities may be increased or decreased, according to the size of the animal or bird to be operated on. If the soap and arsenic are left out, it will answer better, as they leave it greasy. To be put on with a sponge fastened on the end of a stick. Use very cautiously; mark poison.

3.—To preserve skins of any kind. First stretch them out on a board with tacks as soon as taken from the body; then cover them with wood ashes; let them remain a fortnight, and renew the ashes every three days.

4.—The following soap is recommended by Ward, of London: The skins must be well scraped and divested of all fat, and well rubbed with the soap; yellow

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soap, 1 lb.; lime, 1 oz.; camphor, 1 oz.; arsenic, 1 oz.; alum, 1 oz.; mixed together.

5.—Sublimed sulphur and nitrate of potash, of each 2 dr.; black pepper, camphor, bichloride of mercury, burnt alum, and tobacco, of each  $\frac{1}{2}$  oz.; reduce to a fine powder.

6.—Bichloride of mercury, 1 oz.; hydrochloric acid, 3 dr.; methylated spirit of wine, add to, 2 oz. Use as follows: Pour sufficient into a cup, and paint it freely on with a brush, especially about the cavities of the skull, the arms, wings, and thighs. A liberal supply of the powder (No. 3) afterward to the same parts will insure their keeping any length of time (that is, if you have any doubt about their keeping). If you would prefer it, you may use the powder alone.

### Gilding or Silvering.

The cover is first washed with clear gum water. The parts to be gilded are then coated twice with white of egg beaten to a froth and allowed to subside into a clear liquid. A little ammonia may be added. To gild spread a leaf of gold on the gilding cushion with a knife, and blow it flat, then cut it into strips about one-fifth inch wide. Heat the tool until it is just hot enough to fizz under the wet finger; if it sputters it is too hot and will burn the leather; touch its edge with a rag slightly moistened with sweet oil, and with the same rag rub over the part of the book to be gilt. Roll the tool softly on the strips of gold, which will adhere to it, and when enough is taken up roll it with a heavier pressure along the places to be gilt, and the gold will be transferred to the leather, the excess being wiped away with a soft rag.

**Lettering.**—a.—Glair.—An albumen paste, or size, used for many purposes connected with gilding, is made as follows: Whisk up the white of an egg in from 4 to 6 oz. of warm water.

b.—Gold Blocking.—For fixing gold lettering on leather books a process is employed known as gold blocking. The leather is first prepared by a thin coating of glair. This is allowed to dry and is then rubbed over with a pad or soft cloth that has been dipped in olive oil. The gold leaf is then laid on, and the metal die, heated to about the temperature of a laundry iron when in use, is pressed firmly upon it, driving the lettering so far into the leather and the board underneath it that the letters become permanent. At the same time the heat of the type unites the oil with the glair, and the

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gold with both, and leaves those parts not so impressed quite free from fixed adhesion. The surplus gold and oil are then easily removed with a soft cotton pad, after which the surplus glair may be removed with tepid water and a fresh pad.

### Hardening Leather.

**Leather, To Harden.**—Ordinary hemlock tanned sole leather may be said to be hardened without any material alteration of its nature by the following treatment. Prepare a bath as follows: Slaked lime,  $\frac{1}{2}$  lb.; sal soda, 2 lb.; water,  $\frac{1}{2}$  gal. Boil together, cool, and add—Slaked lime,  $\frac{1}{2}$  lb.; water,  $\frac{1}{2}$  gal. Put the leather into this for three days, then remove and put it into a bath of—Slaked lime, 3 lb.; water,  $1\frac{1}{2}$  gal.; and let it soak in this for from two days in summer to three days—or even four days—in winter. When taken out of this, pass through water heated to about  $180^{\circ}$  F., and then pass between heavily weighted rolls, or if a denser material is demanded, press in a hydraulic press. When subjected to the latter, a product nearly as hard as vulcanite is obtained, but one still possessing the appearance and nature of leather quite distinctly.

### Harness.

**Blackings.**—1.—Melt 2 oz. of mutton suet and 6 oz. of beeswax together, add 6 oz. of sugar candy, 2 oz. of soft soap,  $2\frac{1}{2}$  oz. of lampblack,  $\frac{1}{2}$  oz. of powdered indigo, and when thoroughly mixed add  $\frac{1}{4}$  pt. oil of turpentine.

2.—Take  $\frac{1}{4}$  oz. of isinglass,  $\frac{1}{4}$  oz. of finely powdered indigo, 4 oz. of soft soap, 5 oz. of glue, 4 oz. of logwood, 2 pt. of vinegar,  $\frac{1}{2}$  oz. of ground animal charcoal, and 1 oz. of beeswax. The color of the logwood is to be extracted by putting it into the vinegar and applying a gentle heat, then strain it and add the other ingredients, boil till perfect solution takes place, and store up in glass or stoneware jars. This is very useful for army harness.

3.—A good blacking for a working harness, which is to be applied with a sponge and polished with a brush, is prepared as follows, and should be applied at least once a week. Melt 4 oz. of mutton suet with 12 oz. of beeswax, then add 12 oz. of sugar candy, 4 oz. of soft soap dissolved in water, and 2 oz. of finely powdered indigo. This, when well mixed, is thinned out with  $\frac{1}{2}$  pt. of turpentine.

4.—Molasses, 8 oz.; lampblack, 1 oz.; 1 teaspoonful of yeast; sugar candy, 1 oz.; olive oil, 1 oz.; gum tragacanth, 1 oz.; and

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1 oz. of isinglass. To this is added a cow's gall, then mix with 2 pt. of stale beer, and stand by the fire for one hour.

5.—Mutton suet, 2 oz.; beeswax, 6 oz.; melt and add—Sugar (in fine powder), 6 oz.; soft soap, 2 oz.; lampblack, 2½ oz.; iudigo (in fine powder), ½ oz. When thoroughly incorporated, add turpentine, and pour into tins or other receptacles.

6.—Brown shellac, 370 parts; Venice turpentine, 190; alcohol, 1,600; lavender oil, 60; lampblack, 30.

7.—Shellac, 24 parts; sandarac, 4; elemi, 4; Venice turpentine, 16; oil of turpentine, 12; alcohol, 100; lampblack, 40. The rosins and turpentine are mixed with the oil of turpentine and heated to boiling, the alcohol being stirred into the cooled mass, and followed by the lampblack.

*Grease*.—1.—Take ammonia soap, 4 parts; palm oil, 1 part; ordinary hard soap, 3 parts; solution of tannin (9 to 16 of tannin in 4 of water), 1¾ parts; melt the oil and soap together, then add the ammonia soap and the tannin solution and thoroughly mix. No more of this grease is to be used than the leather will absorb, and it should be kept in a stone bottle well corked. The ammonia soap is previously made by heating olive oil to boiling point, and adding sesquicarbonate of ammonium until the odor of the ammonia no longer disappears.

2.—Soap, 2 parts; sugar, 2; water, 4; potash, 1; rape oil, 20. The solids are dissolved in the water, and stirred with the rape oil, in the warm, until a uniform mixture is obtained.

*Oil*.—1.—A good oil for farm and team harness is made by melting 3 lb. of beef tallow, but do not let it boil, then pour in gradually 1 lb. of neat's-foot oil and stir till cold. If properly prepared the grease will be perfectly smooth and soft; if not it will be more or less granulated. A little lampblack may be used to color.

2.—Melt together 2 oz. asphaltum and 3 oz. beeswax, remove from the fire and add ½ oz. fine lampblack and ½ dr. of Prussian blue in fine powder; then reduce to a thin paste with neat's-foot oil.

3.—Black aniline, 35 gr.; muriatic acid, 50 minims; bone black, 175 gr.; lampblack, 18 gr.; yellow wax, 2½ av. oz.; oil of turpentine, 22 fl. oz.

4.—Oil of turpentine, 8 fl. oz.; yellow wax, 2 av. oz.; Prussian blue, ½ av. oz.; lampblack, ¼ av. oz. Melt the wax, add the turpentine, a portion first to the finely powdered Prussian blue and lampblack, and thin with neat's-foot oil.

*Polish*.—1.—Harness polish is made by

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breaking 4 oz. of glue in pieces and pouring over it 1 pt. of vinegar. This is allowed to remain until perfectly soft, then make another solution of 2 oz. of gum arabic and half a pt. of black ink; to mix add another half pt. of vinegar to the glue solution over a moderate fire, but do not let it boil. When it is dissolved add the gum solution, keep at a temperature of 180° F., and further add 2 dr. of isinglass in a little water, then remove from the fire and draw off for use. It is to be applied by a sponge, and a very thin coat given, allowing to dry quick, which gives a better polish.

2.—Mutton suet, 2 oz.; beeswax, 6 oz.; sugar, 6 oz.; soft soap, 2 oz.; lampblack, 1 oz.; spirit of turpentine, 4 oz.; water, 4 oz.

3.—French Polish.—Logwood chips, ¼ lb.; glue, ¼ lb.; indigo, ¼ oz.; soft soap, ¼ oz.; isinglass, ¼ oz.; boil in 2 pt. vinegar and 1 pt. water for quarter of an hour; strain and bottle for use. The leather must be freed from dirt, and the polish applied with a piece of sponge.

*Preserving*.—To preserve harness and leather exposed to the action of ammonia given off in stables, and which causes it to rot, although it may be protected by grease, is to add to the oil or fat that is employed a small quantity of glycerine, which is said to keep the leather always soft and pliable.

*Restoring*.—1.—Harness that has become soiled can be restored by the use of the following French blacking: Stearine, 4½ lb.; turpentine, 6¾ lb.; animal charcoal, 3 oz. It is prepared by beating the stearine into thin sheets, then mixing with the turpentine, and heating in a water bath during continual stirring, then the charcoal is added and the whole placed in another vessel and stirred so as to prevent its crystallizing. It must be warmed when using and rubbed on with a cloth as quickly as possible, giving it a very thin coat, and when nearly dry polish with a silk cloth.

2.—Leather-covered Mountings.—Melt 3 parts white wax, then add 1 part gum copal, dissolved in linseed oil, and 1 of ivory black; allow the mass to boil for five minutes, remove it from the fire, stir until cold, and roll up into balls.

*Russet Leather*.—Mix together 1 part palm oil and 3 parts common soap, and heat up to 100° F.; then add 4 parts oleic acid, and 1¾ of tanning solution, containing at least 1-16 of tannic acid (all parts by weight) and stir until cold. This is recommended as a valuable grease

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for russet leather, and as a preventive of gumming.

**Vaseline Harness Composition.**—Prussian blue, in fine powder,  $\frac{3}{4}$  oz.; lamp-black, 4 oz.; molasses, 2 oz.; soft soap, 2 oz. Mix together in a large Wedgwood mortar, previously warmed, and add: Vaseline, 6 oz.; ceresine, 5 oz.; yellow rosin,  $\frac{1}{2}$  oz. Melted together, then sufficient turpentine to give the composition the proper consistency. Mix thoroughly.

**Waterproof Dressing.**—1.—A waterproof liquid is made from India rubber in chips, 1 oz., and boiled oil 1 pt., dissolving by the aid of heat, then finally stir in another pt. of hot boiled oil. Another waterproof composition is boiled oil, 1 pt.; beeswax, 2 oz.; yellow rosin, 2 oz.; and melted all together.

2.—Take salad oil, 1 pt.; mutton suet, 4 oz.; spermaceti, 1 oz.; white wax, 1 oz.; and melt together.

3.—Bisulphide of carbon, 2 oz.; gutta percha,  $\frac{1}{2}$  oz.; asphaltum, 2 oz.; brown amber,  $\frac{1}{2}$  oz.; linsed oil, 1 oz. First dissolve the gutta percha in bisulphide of carbon, then the asphaltum and amber in the oil and thoroughly mix together.

4.—Waterproof harness paste is made by putting into a glazed vessel 2 oz. of black rosin, which is melted over a fire. When dissolved add 3 oz. of beeswax, and when this is melted remove from the fire, then add  $\frac{1}{2}$  oz. of fine lampblack,  $\frac{1}{2}$  dr. of Prussian blue in powder. These are stirred well together, and enough turpentine is added to form into a thin paste. Allow to cool, apply with a sponge, and finally polish with a soft brush.

**Wax.**—1.—Mix together  $1\frac{1}{2}$  pt. red acid (chromic); beer, 1 pt.; thick glue, 1 gill; ivory black, 2 oz.; indigo, 1 dr. Boil for half hour and apply with a sponge.

2.—Melt together, white wax, 1 lb.; crown soap, 1 lb.; ivory black, 2 oz.; indigo, 5 oz.; nut oil,  $\frac{1}{2}$  pt. Dissolve over a slow fire, stir until cool, and turn into small molds.

3.—Oil of turpentine, 900 parts; yellow wax, 90 parts; Prussian blue, 10 parts; indigo, 5 parts; bone black, 50 parts. Dissolve the wax in the oil, by aid of low heat, in a water-bath. Mix the remaining ingredients, which must be well powdered, and work up with a portion of the solution of wax. Finally, add the mixture to the solution, and mix thoroughly in the bath. When a homogeneous liquid is obtained, pour into earthen boxes.

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#### Hides.

**Buffalo Hides, To Soften.**—Apply cod oil or dubbing, either of which can be obtained at a carrier's shop.

**Preserving.**—An immersion of hides for twenty-four hours in a 2% solution of carbolic acid, and subsequently drying them, has been successfully substituted for process of salting.

#### Polish.

1.—Yellow wax, 1 oz.; carnauba wax, 2 oz.; oil turpentine, 10 fl.oz.; benzine 10 fl.oz. Melt the waxes carefully, add the oil and benzine, and stir until cold.

2.—Yellow wax, 5 oz.; oil turpentine, 11 fl.oz.; amber varnish, 5 fl.oz. Melt the wax, add the oil, and then the varnish.

3.—Stick-lac, 25 parts; shellac, 20 parts; gum benzoin, 4 parts; alcohol, 96%, 100 parts; oil of rosemary, 1 part. Powder the gums and dissolve in the alcohol, adding the oil to the solution. After standing several days filter.

4.—Suet, 50 parts; yellow wax, 150 parts; sugar, 150 parts; black soap, 50 parts; oil of turpentine, 10 parts; water, 30 parts. Melt the suet and wax together. Dissolve the soap in the water by the aid of heat and add to the wax and suet. Add the sugar under constant stirring and remove from the fire. Let cool down and stir in the oil of turpentine.

5.—Turpentine, 50 parts; shellac, 100 parts; alcohol, 420 parts; logwood extract, 10 parts; potassium dichromate, 3 parts; indigo sulphate, 5 parts. The shellac is dissolved in the alcohol and the other ingredients added to the solution.

#### Preserving and Restoring.

1.—For leather preservatives that are waterproof: Beeswax, 18 parts; spermaceti, 6 parts; oil turpentine, 66 parts; asphalt varnish, 5 parts; borax, powdered, 1 part; vine twig, black, 5 parts; Prussian blue, 2 parts; nitro benzol, 1 part. Melt the wax, add powdered borax and stir till a kind of jelly has formed. In another pan melt spermaceti, add the asphalt varnish, previously mixed with oil of turpentine, stir well, and add to the wax. Lastly add the color, previously rubbed smooth with a little of the mass. Perfume with nitro benzol and pour into boxes. Apply in small quantities, wipe with a cloth, and brush. Use only once a week.

2.—There is nothing as good as castor oil for preserving leather. Applied once a month, or once or twice a week in

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### (Shoe Polishes)

snowy weather, it not only keeps the leather soft, but makes it waterproof. Copal varnish is the best thing to apply to the soles; but the latter should be thoroughly dry, and if they have been worn, they should be previously roughed on the surface before applying the varnish. Linseed oil is perhaps better than nothing, but it rots the leather; hence the objection to dubbings and other mix-ups of mutton suet, linseed oil, etc. With regard to castor oil, it may further be said that it does not prevent a polish being produced on the boots; and that leather so treated is avoided by rats, if even its proportion be only one-third to two-thirds tallow.

3.—Equal parts of mutton fat and linseed oil, mixed with one-tenth their weight of Venice turpentine, and melted together in an earthen pipkin, will produce a "dubbin" which is very efficacious in preserving leather when exposed to wet or snow, etc. The mixture should be applied when the leather is quite dry and warm.

### Shoe Polishes and Leather Softening Preparations.

Most of the preparations used as shoe polishes consist of syrup, sulphuric acid, and bone black or lampblack, incorporated with a suitable proportion of low-class fat, such as fish blubber, rancid lard, etc. When bone black, i. e., powdered carbonized bones, is mixed with sulphuric acid, the calcium phosphate in the black combines with the acid to form potassium acid phosphate and calcium sulphate, the finely divided carbon in the black being set free and imparting to the polish its deep black color. The syrup also undergoes a change when brought into contact with the acid, carbon being liberated. The addition of fat facilitates the application of the polish to the leather, and produces the polish when brushed for a short time. Bone black may also be replaced by lampblack or vine black; and this modification is attended with certain advantages over recipes containing sulphuric acid. When this acid is used it is necessary to employ only just so much as will be fully neutralized by combination with the calcium phosphate of the bone black, since any excess of free acid will gradually destroy the leather to which the polish is applied. The leather will become covered with fine cracks, and will finally break in a number of places at once. When one is not afraid of the trouble involved in intimately mixing with fat the finely divided carbon obtained in

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lampblack or Frankfort black, this mixture, when incorporated with the other ingredients, will form shoe polishes of unimpeachable color, that not only do not corrode the leather but actually preserve it, owing to the presence of the fatty constituents.

**Beach Shoes.**—1.—Pale Brown.—Water, 150 kilos; borax, crystallized, 5 kilos; glycerine, technical, 2 kilos; spirit of sal ammoniac, technical, 0.25 k.; white shellac, 25 k.; yellow, No. 690, water-soluble, 8 k.; orange R, 0.3 k.; formalin, 0.125 k. Stir the glycerine and the spirit of sal ammoniac together in a special vessel before putting both into the kettle. It is also advisable, before the water is boiling, to pour a little of the nearly boiling water into a clean vessel and to dissolve the colors therein with good stirring, adding this solution to the kettle after the shellac has been dissolved.

2.—Orange.—Water, 150 kilos; borax, crystallized, 5 k.; glycerine, technical, 2.5 k.; spirit of sal ammoniac, technical, 0.25 k.; white shellac, 22.5 k.; orange R, water-soluble, 0.8 k.; brown, No. 2923, 0.3 k.; formalin, 0.125 k.

3.—Yellow.—Water, 150 kilos; borax, crystallized, 5 k.; glycerine, technical, 2.5 k.; spirit of sal ammoniac technical, 0.25 k.; white shellac, 25 k.; yellow pigment (No. 690), water-soluble, 0.8 k.; formalin, 0.125 k.

**Blackings.**—1.—Ivory black, 120 parts; brown sugar, 90 parts; olive oil, 15 parts; stale beer, 500 parts. Mix the black, sugar, and olive oil into a smooth paste, adding the beer, a little at a time, under constant stirring. Let stand for 24 hours, then put into flasks, lightly stoppered.

2.—Ivory black, 200 parts; molasses, 200 parts; gall nuts, bruised, 12 parts; iron sulphate, 12 parts; sulphuric acid, 40 parts; boiling water, 700 parts. Mix the molasses and ivory black in an earthen vessel. In an iron vessel let the gall nuts infuse in 100 parts of boiling water, for 1 hour, then strain and set aside. In another vessel, dissolve the iron sulphate in another 100 parts of the boiling water. One half of this solution is added at once to the molasses mixture. To the remaining half add the sulphuric acid, and pour the mixture, a little at a time, under constant stirring, into the earthen vessel containing the molasses mixture. The mass will swell up and thicken, but as soon as it commences to subside, add the infusion of gall nuts, also under vigorous stirring. If a paste blacking is desired the preparation is now

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### (Shoe Polishes)

complete. For a liquid black add the remaining portion of the boiling water (500 parts), stir thoroughly and bottle.

3.—Nicolet's "French Polish" for ladies' shoes is, according to the specifications of his patent, prepared as follows: Beeswax, 150 parts; tallow, 15 parts; linseed oil, 200 parts; litharge, 20 parts; molasses, 100 parts; lampblack, 103 parts; oil turpentine, 280 parts. Mix the oil, litharge, and molasses, and heat to 240° or 250° F., stirring until thoroughly incorporated, then add the wax and tallow, and stir in. Add the lampblack and incorporate thoroughly. Remove from the fire and add the oil of turpentine. Finally make a solution of the following and incorporate with the above: shellac, 5 parts; aniline black, 2 parts; alcohol, 95%, 35 parts.

4.—Bone black, 120 parts; olive oil, 30 parts; syrup, 60 parts; sulphuric acid, 30 parts. These bodies are mixed, the black being first rubbed down in the oil, the syrup stirred in next, and the acid last.

5.—Gum arabic, 30 parts; grape sugar, 30 parts; water, 500 parts. The gum and sugar are dissolved in the warmed water, and the solution is gradually mixed with the first mixture. The finished article is filled into bottles.

6.—Dressings for ladies' shoes must be somewhat varnish-like, so as not to rub off when the leather becomes damp. They of course tend to harden the leather. Aniline black, 5 parts; camphor, 10 parts; shellac, 120 parts; wood alcohol, 365 parts. The wood alcohol is used only because it is cheaper than grain alcohol; the latter may be employed if desired. Shellac, which is the ingredient giving lustre to the dressing, may also be dissolved in an aqueous alkaline solution, according to the appended recipe: Shellac, 2 oz.; ammonia water, 1 oz.; water, 6 oz.; aniline black sufficient to color. Boil all the ingredients together, except the aniline, until the shellac is dissolved; then add the aniline and sufficient water to make the liquid up to the measure of 16 oz.

7.—Hager gives the following formula for producing a similar result in a different way: Gallic acid, 5 grams; borax, 5 grams; logwood extract, 2.5 grams; aniline black, 10 grams; ammonia water, 10 grams; hot water, 50 grams; aqueous shellac varnish (as below), 2,000 grams. The aqueous shellac varnish is prepared as follows: Borax, 100 grams; water, 2,250 grams; powdered shellac, 300 grams. Heat the water to the boiling point, dissolve in it the borax, and then

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add the shellac in small portions, stirring the liquid constantly until solution is effected. When cool, strain.

8.—The following makes a very brilliant and durable black polish for shoes: Bone black, 40 parts; sulphuric acid, 10 parts; fish oil, 10 parts; sodium carbonate, crystal, 18 parts; sugar, common brown, or molasses, 20 parts; liquid glue, prepared as below, 20 parts; water, enough. Soak 10 parts of good white glue in 40 parts of cold water for four hours, then dissolve by the application of gentle heat, and add 1.8 parts of glycerine (commercial). Set aside. Dissolve the sodium carbonate in sufficient water to make a cold saturated solution (about 3 parts of water at 15° C., or 60° F.), and set aside. In an earthenware vessel moisten the bone black with a very little water, and stirring it about with a stick, add the sulphuric acid, slowly. Agitate until a thick dough-like mass is obtained, then add and incorporate the fish oil (any sort of animal oil, or even cod-liver oil, will answer, but it is best to avoid high-smelling oils). Now add a little at a time, and under vigorous stirring, sufficient of the saturated sodium carbonate solution to cause effervescence. Be careful not to add so freely as to liquify the mass. Stir until effervescence ceases, then add the molasses or sugar, the first, if you want a soft, damp paste, and the latter if you desire a dryer one. Finally add, a little at a time, and under constant stirring, sufficient of the solution of glue to make a paste of the desired consistency. The exact amount of this last ingredient that is necessary must be learned by experience. It is, however, a very important factor, as it gives the finished product a depth and brilliancy that it could not otherwise have, as well as a certain durability in which most of the blackings now on the market are deficient. Made as described, this is a superb article, one well worth the extra expense and trouble of preparing it.

9.—Belgian Blacking.—Potatoes, 10 parts; sulphuric acid, 1 part; bone black, 5 parts; lard, 20 parts; fish oil, 40 parts. The potatoes are pulped, suffused with the sulphuric acid and heated, with constant stirring, in a stoneware or porcelain vessel, until the mass has turned dark brown. The bone black is next added, followed by the fat and fish oil in the warm. Vigorous stirring is important. Should the mass prove too stiff, it is suitably thinned down by gradual additions of fish oil. Care, however, is needed here to prevent the mass keeping too thin

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and becoming greasy, in which event a little bone black must be added.

10.—Collapsible Tubes.—Ozokerite,  $5\frac{1}{2}$  oz.; ceresine, 2 lb.; carnauba wax,  $5\frac{1}{2}$  oz.; beeswax, 1 $\frac{3}{4}$  oz.; oil of turpentine, 4 pt.; lampblack, 2 lb.; black aniline dye, 30 gr.; perfume, enough. As you proceed with your work doubtless desirable changes will suggest themselves to you.

11.—Ferrocyanide Blacking.—a.—Potassium ferrocyanide, 32 parts; water, 9,000 parts.

b. Green vitriol, 100 parts; water, 1,000 parts; nitric acid, 15 parts.

12.—Lyons Blacking.—This French preparation is distinguished by its property of producing a beautiful black polish on leather without injuring the quality of the latter, whilst at the same time its prolonged use renders the leather nearly waterproof. On this account the article deserves close attention, especially since it can be produced cheaply. The following recipe will furnish an article of the highest quality: a.—Soap, 20 parts; starch, 10 parts; gall nuts, 10 parts; green vitriol, 10 parts; water, 2,000 parts. b.—Syrup, 60 parts; bone black, 30 parts. The substances grouped under (a) are boiled together for an hour, then strained through a linen cloth, and stirred carefully with the remaining ingredients while still warm.

13.—Pastes and Creams.—a.—Carnauba wax, 10 parts; beeswax, 20 parts; liquor soda, 40° B, 4 parts; nigrosine, fat-soluble, 15 parts; water, hot, 160 parts; turpentine oil, 60 parts. Melt the carnauba and beeswax together, add the liquor, and continue the heat until saponification takes place, and the mass becomes homogeneous. Let the mass cool down to about 140° F., and gradually add the color, which is dissolved in the turpentine oil, warmed to 125° F. in the water bath.

b.—Paraffine, 30 parts; ceresine, 10 parts; wool fat, crude, 10 parts; liquor caustic soda, 38° B, 2 parts; nigrosine, fat-soluble, solid, 5 parts; oil of turpentine, 180 parts. Melt the paraffine, ceresine and wool fat together, heat to 120° C. (248° F.), add very cautiously, a little at a time, and under constant stirring, the liquor soda. When the foam caused by adding the liquor vanishes, let cool down to 100° C. (212° F.), and dissolve the nigrosine in the mass. Cool down to 80° C. (175° F.), add the oil of turpentine, and stir in thoroughly. Continue the stirring until the mass cools off. It makes a beautiful, shining mass which, when ready for filling into small packages,

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must be heated just enough to make sufficiently soft to flow slowly.

c.—Without Oil.—Carnauba wax, 600 parts; beeswax, 150 parts; sodium carbonate, 60 parts; tallow soap, hard, yellow, 65 parts; water, 5,500 parts; formalin, 10 parts. Melt the carnauba and beeswax together. Dissolve the soap, the soda, and the color in the water, by the aid of heat, and add the hot solution to the melted wax, in a slow, small stream, and under constant stirring. As a color, use about 2% of water-soluble aniline color, such as nigrosine, Bismarck brown, crystalin yellow, etc.

d.—Paraffine, high melting, 20 parts; wool fat, crude, 10 parts; liquor soda, 38° B, 5 parts; carnauba wax, 20 parts; nigrosine, fat-soluble, 5 parts; water, 250 parts; nigrosine, water-soluble, 4 parts. Warm the paraffine and wool fat together to 100° C. (212° F.), add the liquor soda, all at once, and heat for 20 minutes, until it forms a smooth, homogeneous mass. Now add the carnauba wax, all at once, and continue boiling until it is saponified and homogeneous, then add and dissolve the fat-soluble nigrosine, and stir in. Add under constant stirring, 150 parts of hot water, in small quantities, gradually. Finally, dissolve the water-soluble nigrosine in the remainder of the water, and add the solution to the mass, and stir in. As a preservative a half part of formalin may be added.

e.—Soap, 122 parts; potassium carbonate, 61 parts; beeswax, 500 parts; water, 2,000 parts. Mix and boil together until a smooth, homogeneous paste is obtained, then add—Ivory black, 1,000 parts; rock candy, powdered, 153 parts; gum arabic, powdered, 61 parts; and mix thoroughly. Remove from the fire and pour while still hot into boxes.

14.—Spermaceti Polish.—a.—Beeswax, 90 parts; spermaceti, 30 parts; oil of turpentine, 350 parts, are melted together, and asphalt lac, 20 parts; lampblack, 10 parts; Prussian blue, 10 parts, are stirred into the liquid, the mass being scented, if desired, with 5 parts of nitrobenzol.

b.—Yellow wax, 18 parts; spermaceti, 6 parts; oil of turpentine, 66 parts; asphalt varnish, 5 parts; borax in powder, 1 part; vine-twig black, 5 parts; Prussian blue, 2 parts; nitrobenzol, 1 part. Melt the wax and stir in the borax. In another vessel melt the spermaceti, and when hot remove from the fire and stir in the asphalt varnish, previously mixed with the turpentine. Now add the wax and borax under vigorous stirring. Rub

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up the colors with a portion of the wax and borax, reserved for the purpose, to a smooth paste, and incorporate it with the rest of the mixture. The nitrobenzol is used simply as a perfume. To use: With a brush or rolled rag apply to the leather, and spread well; wipe with a cloth, and polish with a brush. Any good vegetable black may be used, instead of that specified, and a portion of nigrosine may be added as an intensifier.

c.—Ivory black, 2 lb.; sperm oil, 4 oz.; molasses, 1 lb.; vinegar, 5 oz.; strong sulphuric acid, 4 oz.; sulphate of iron, 4 dr.; gum arabic, 6 dr.; hot water, 5 oz. Mix the black, sperm oil, molasses and vinegar together in the order named, and gradually add the sulphuric acid. Heat, if necessary, until effervescence ceases; then add the iron and gum arabic, previously dissolved in the hot water.

Stick Polish.—Tallow, 40 parts; yellow wax, 10 parts; oil of turpentine, 5 parts. Melted together and stirred with a previously prepared mixture of 5 parts of fine black and 10 parts of olive oil. The fluid mass is cast into sticks, and these are rubbed against the leather, which is then polished with a woolen rag.

"Tree's" Blacking.—Gum tragacanth, dissolved in water; then add a little ink to make it black, and finally add a small quantity of neatsfoot oil. It must be quite thin, or else, if thick, it is likely to cake.

Boots.—1.—Antacid Boot-Leather Varnish.—As the name implies, this preparation is free from acid. It forms a kind of stain, containing the necessary adhesive substances to enable it to stick properly to the leather. It is prepared as follows: Powdered gallnuts, 50 parts; logwood, 30 parts; water, 200 parts. These are boiled for 2 hours, filtered, and syrup, 200 parts, and green virriol, 30 parts, are dissolved in the liquid, which is next boiled until it begins to thicken, whereupon a solution of ruby shellac, 1 part, and alcohol, 20 parts, is added, and well stirred in, the liquid product being then filled into bottles.

2.—Boot-top Liquid.—a.—Wash the tops with soap and water and scrape them with the back of a knife. Then apply the following with a hare-foot brush: Oxalic acid, 1 oz.; water, 1 pt.; use the back of a knife as before; then polish with the following: Powdered gum arabic,  $\frac{1}{2}$  oz.; red spirits of lavender, 2 oz.; powdered turmeric,  $\frac{1}{2}$  oz.; pencil this over the top, let it half dry, then polish by rubbing it, one way only, with a flannel, till it shines.

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b.—White top: Magnesia, alum, cream of tartar and oxalic acid,  $\frac{1}{4}$  oz. each; potassium binoxalate,  $\frac{1}{4}$  oz.; sugar of lead,  $\frac{1}{4}$  oz. Dissolve in 1 qt. of water, and apply with a sponge.

c.—Brown top: Oxalic acid, alum, annatto, each 1 oz.; isinglass,  $\frac{1}{2}$  oz.; sugar of lead,  $\frac{1}{2}$  oz.; salt of sorrel,  $\frac{1}{4}$  oz. Boil together in 1 qt. of water for 10 minutes. Apply with a sponge.

d.—Boot Uppers.—Soap, 100 parts, dissolved in water, 1,000 parts; to which are added, glycerine, 100 parts; beef tallow, 25 parts; fish oil, 25 parts; colophony, 25 parts. The whole is boiled for some time, and then stirred until cold.

3.—Varnish.—Shellac, 100 parts; pine rosin, 20 parts; Venice turpentine, 50 parts; oil of turpentine, 40 parts; alcohol, 1,000 parts; lampblack, 40 parts. When applied to belts, this varnish, which is fairly elastic, soon forms a fine uniform coating, which dries rapidly, and does not easily crack, even when the leather is strongly bent. For this reason it is very useful for boot leather.

Brown Dressing. 1.—For Untanned Shoes.—Yellow wax, 300 parts; soap, 120 parts; Nankin yellow, 25 parts; oil of turpentine, 1,000 parts; alcohol, 120 parts; water, 1,000 parts. Dissolve in the water bath the wax in the oil of turpentine; dissolve, also by the aid of heat, the soap in the water, and the Nankin yellow (or in place of that any of the yellow coal-tar colors) in the alcohol. Mix the solutions while hot, and stir constantly until cold. The preparation is smeared over the shoes in the usual way, rubbed with a brush until evenly distributed, and finally polished with an old silk or linen cloth.

2.—"Ne Plus Ultra" is produced as follows: Take water, 18 l.; rosin oil,  $4\frac{1}{2}$  l.; spirit of sal ammoniac, concentrated, 1 l. 5 l.; white-grain soap, 1,930 kgm.; Russian glue, 1,500 kgm.; brown rock candy, 0,570 kgm.; Bismarck brown, 0,070 kgm. Boil all the ingredients together, excepting the pigment; after all has been dissolved add the Bismarck brown, and filter. The dressing is applied with a sponge.

Buckskin Shoes, etc., To Restore the Black, Velvety Appearance of.—First wet the surface well with strong alum water, and when nearly dry treat with a decoction of logwood, boiled and filtered, to which is added a little acetate of iron. The skin will not be as soft as it originally was.

Cleaning.—1.—One way of making a combination shoe dressing and cleaner is



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to melt beeswax, and, while it is hot, adding about  $2\frac{1}{2}$  times its weight of mucilage of gum arabic to it, and then twice as much water as mucilage.

2.—Yellow wax, 4 oz.; pearlash,  $\frac{1}{2}$  oz.; yellow soap,  $\frac{1}{4}$  oz.; oil of turpentine, 8 oz.; water, enough to make 24 oz. Scrape the wax fine, and add it, together with the ash and soap, to 12 oz. of water. Boil all together until a smooth, creamy consistency is obtained; remove the heat and add the turpentine. Mix thoroughly, and add enough water to make the finished product measure 24 oz.

3.—Eggs, 5; sperm oil, 6 oz.; acetic acid, 6 dr.; glycerine, 6 dr.; oil of turpentine, 1 oz.; alcohol, 5 oz.; lampblack, 1 oz.; water, enough to make 30 oz. Beat up the eggs thoroughly with an egg beater. Mix the oils, acid and glycerine, and add gradually to the eggs, using the beater constantly. Transfer to a bottle, and add gradually the alcohol (or wood spirit), diluted with its own volume of water; finally make up to 30 oz. with water, and incorporate the lampblack.

*Edges of Shoes, Varnish for.*—Alcohol, 8 fl.oz.; shellac, 2 oz.; rosin, 1 oz.; turpentine,  $\frac{1}{2}$  oz.; lampblack,  $\frac{1}{4}$  or  $\frac{1}{8}$  oz.

*Enamelled Leather, Liquid Renovator for.*—Paraffine oil, 48 parts; oil of lavender, 1 part; essence of citronelle, 1 part; spirits of ammonia, 2 parts. Mix all together, and shake the bottle well before using, laying on a coating with a sponge, and polishing with a soft cloth or leather afterward.

*Green Boots, Polish for.*—A polishing cream for the fashionable green boots may be prepared by melting together 20 parts of yellow wax and 3 parts of pale rosin over a water bath, and stirring in 18 parts of turpentine oil, the whole being colored with four parts of chlorophyl and packed in metal boxes.

*Heel Polish for Shoemakers.*—Melt together Japanese wax, 1,000; carnauba wax, 1,000; paraffine, 1,000; and mix with turpentine oil, 5,000, as well as a trituration of lampblack, 100; wine black, 200; turpentine oil, 700.

1.—Crushed galls, 1 lb.; extract of logwood, 4 oz.; copperas,  $\frac{1}{2}$  lb.; gum arabic,  $\frac{1}{2}$  lb.; fine lampblack, 6 oz.; salicylic acid, 3 dr.; alcohol, 8 oz.; water, enough. Boil the galls and logwood in  $\frac{1}{2}$  gal. of water for half an hour, strain, and wash the strainer with enough water to make the decoction measure  $\frac{1}{2}$  gal. Dissolve the copperas and gum arabic in 3 pt. of water, add this to the first solution, and again boil for 10 minutes, and strain. Mix the lampblack, salicylic acid and al-

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cohol together, and form a smooth cream with them by the addition of a small quantity of the liquid. Finally, mix the cream with the remaining portion of the liquid.

2.—Nigrosine, 1 oz.; gall ink (without gum), 2 pt.; ground shellac, 2 oz.; powdered borax, 1 oz.; water, 12 oz. Dissolve the nigrosine in the gall ink by vigorous shaking. Dissolve the borax and shellac in the water, mix all together, and strain.

3.—Powdered galls, 2 oz.; copperas, 1 oz.; copper sulphate, 30 gr.; powdered gum arabic, 1 dr. This may be dispensed as a powder, with directions to dissolve in a quart of boiling water and allow the whole to stand a week before using.

*Kid Leather.*—1. Cream for greasing fine varieties of leather, such as kid, patent leather, etc., is produced as follows, according to tried receipts:

a.—Black Cream.—Lard, 100; yellow vaseline, 20; glycerine, technical, 10; castor oil, technical, 10. Dye black with lampblack and perfume with oil of mirbane.

b.—Colored Cream.—Lard, 100; castor oil, 20; yellow wax, 25; white vaseline, 30. Dye with any desired dye stuff, e. g., red with anchusine, green with chlorophyl. In summer it is well to add some wax to the first and second prescriptions.

c.—White cream.—Lard, 75; glycerine, technical, 25; mirbane oil, ad libitum.

2.—Dressing for Kid Shoes.—Yellow ceresine, 25 parts; oil of turpentine, 25 parts; castor oil, 25 parts; linseed oil, 250 parts; wood tar, 7 parts. Dissolve the ceresine and tar in the oil of turpentine, mix the heavy oils, pour the liquids together and stir until homogeneous. Add mirbane oil sufficient to disguise the turpentine odor.

*Oil for Preserving Shoe Leather.*—1.—Olein (olive, almond or lard oil), 60 parts; liquid vaseline, 15 parts; castor oil, 5 parts; rosin oil, 25 parts. Mix. Apply very lightly to the leather, and do not repeat until the former application has been completely absorbed.

*Patent Leather.*—1.—Wax, 22 parts; olive oil, 60 parts; oil of turpentine, 30 parts. Melt with gentle heat the wax in the olive oil, and as soon as melted remove from the fire. When nearly cold stir in the turpentine.

2.—Cracks, To Cover.—Use the following: Take molasses or sugar,  $\frac{1}{2}$  lb.; gum arabic, 1 oz.; and ivory black, 2 lb.; boil them well together, then let the vessel stand until quite cooled; after which bottle off. This is an excellent reviver,

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and may be used as a blacking in the ordinary way, no brushes for polishing being required. The first coats of the Japan for patent leather are made with linseed oil and Prussian blue, boiled together for some hours; the last coat or varnish, with linseed oil and lampblack, similarly boiled. Each coat is separately dried at a temperature of 160 to 180° F. (71 to 82° C.), and rubbed on the leather by the hand, the skin being nailed on to the surface of a board. As the process is a very delicate one, and requires special knowledge in each part of the operation, it would be useless for any one to attempt to produce japanned leather, except as an experiment, for his own amusement, without serving an apprenticeship to the trade.

3.—Polish.—To restore patent leather to its original appearance after it has lost its fine gloss or become cracked is a task which, we think, cannot be satisfactorily accomplished. Attempts made in this direction have resulted in the formulation of the following recipes:

a.—Yellow wax, 6 dr.; olive oil, 2 oz.; oil of turpentine,  $\frac{1}{2}$  oz.; oil of lavender,  $\frac{1}{2}$  oz. Melt the wax and olive oil together.

add the turpentine, and when nearly cool the oil of lavender. This is said to restore the flexibility of patent leather which has become hardened and to renew its gloss to a certain extent.

b.—Yellow wax (c. ceresine), 3 oz.; spermaceti, 1 oz.; turpentine oil, 11 oz.; asphaltum varnish, 1 oz.; borax, 80 gr.; Frankfort black, 1 oz.; Prussian blue,  $\frac{1}{2}$  oz. Melt the wax and stir well with the borax; melt the spermaceti separately, adding to it the turpentine in which has previously been dissolved the varnish; stir the second mixture into the wax and add the colors.

c.—As a coloring matter where the leather has been scratched, the following may be of service, applied, of course, before the polish: Gum arabic, 4 oz.; molasses, 1 oz.; nutgall ink, 8 oz.; vinegar,  $\frac{1}{2}$  oz.; sweet oil,  $\frac{1}{2}$  oz.; alcohol, 1 oz.; lampblack, 1 dr.

4.—Preserving Patent Leather.—a.—The following is a French recipe for preserving the gloss of patent leather: Melt pure wax over a water bath, place on a moderate coal fire, add first some olive oil, then some lard, and mix intimately by stirring; next add some oil of turpentine, and finally some oil of lavender, fill the resulting paste in boxes, where, on solidifying, the necessary consistency will be acquired. To restore the gloss to the leather apply a little of the paste and rub

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with a linen rag. This will keep the leather soft, and prevent cracking.

b.—Melt wax with a little oil of turpentine, olive oil and lard. Mix thoroughly together. When cool it should be a thick paste. Vaseline is excellent. Allow it to remain on one half hour, then dry with Canton flannel.

Soles.—1.—English Oak Stain for Bottoms of Boots and Shoes.—The process used by the best English shoe manufacturers to stain our hemlock and union sole, so that it shall resemble English oak, is simply as follows: Take equal quantities, say, 1 oz., of borax and oxalic acid and put in 1 qt. of water. Be sure the acid does not predominate, and in some cases a very little more of the borax will be better. Then, when the shoe goes to the finishers, after sandpapering the bottom, when dry, dampen down or wet the grain with this solution, and, when nearly dry, apply French chalk or pipe-clay in the usual way. This brings out a white bottom, finely tinted with a shade of pink. If more yellow, and not so much red, is wanted, put in a little turmeric root or chrome yellow. Care must be taken that the sole is not afterward wet while in stock, or the hemlock color will come out again.

2.—Hardening Soles.—a.—If a pair of new shoes, warm the soles by holding them near a fire or stove, and then varnish them with copal varnish, dry them, warm, and apply a second and third coat. The leather will become waterproof and very hard, lasting about twice as long as if not thus treated.

b.—Stockholm tar rubbed on the soles of shoes hardens the leather materially, renders it impervious to water, and makes it wear much longer than leather not thus treated.

3.—Polish for Shoe Soles.—a.—Melt 1 part of stearine in an iron pot over a fire; remove the pot and place it in another room or in the open air; add 4 to 5 parts of benzine, stirring vigorously. Paint the soles with this mixture and polish with a linen rag.

b.—Dissolve together 5 parts stearine and 1 part of white beeswax. This mixture will be found admirably adapted for polishing shoe soles. A little of the composition should be cut off and rubbed into the soles and the latter afterward polished with a clean rag. Both these preparations are preferable to the ordinary tragacanth solutions.

Tan and Russet Shoe Polish.—1.—Soft or green soap, 2 oz.; linseed oil, raw, 3 oz.; annatto solution (in oil), 8 oz.; yel-

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### (Shoe Polishes)

low wax, 3 oz.; gum turpentine, 8 oz.; water, 8 oz. Dissolve the soap in the water and add the annatto; melt the wax in the oil and turpentine, and gradually stir in the soap solution, stirring until cold.

2.—Yellow wax, 2 oz.; fish oil, raw, 2 oz.; spirit of turpentine, 15 oz.; tincture of green soap, 1 oz.; yellow ochre,  $\frac{1}{2}$  oz.

3.—Yellow wax, 4 oz.; pearlash,  $\frac{1}{2}$  oz.; yellow soap,  $\frac{1}{4}$  oz.; spirit of turpentine, 8 oz.; phosphate (aniline), 4 gr.; alcohol,  $\frac{1}{2}$  oz.; water, a sufficient quantity. Scrape the wax fine, and add it, together with the ash and soap, to 12 oz. of water. Boil all together until a smooth creamy mass is obtained; remove the heat and add the turpentine, and the aniline (previously dissolved in the alcohol). Mix thoroughly, and add sufficient water to bring the finished product up to 24 oz.

4.—Yellow wax (dark), 1 oz.; palm oil, 1 oz.; spirit of turpentine, 3 oz. Melt together on a water bath and color if desired with Nankin brown (5 gr.) dissolved in a little alcohol.

Russet Leather Shoes.—1.—Yellow.—Borax, in crystals, 40 parts; glycerine, 20 parts; ammonia, 2 parts; shellac, bleached, 200 parts; aniline yellow (No. 630) water-soluble, 6 parts; formalin, 1 part; water, 1,200 parts.

2.—Orange.—The same as above, except that instead of 200 parts of bleached shellac, 180 parts of ruby shellac, and instead of yellow, 6.4 parts of orange R, and 2.4 parts of brown (No. 2923), water-soluble are used.

3.—Light Brown.—The same as the first, with the exception of the color, instead of which use 6.4 parts of yellow (G30) and 2.4 of orange R. The following is the method of procedure: Bring the water to a boil, but just before it commences to do so withdraw a portion and in it dissolve the color or colors. To the residue add the borax, and a little later the shellac. As soon as the shellac is dissolved draw the fire, and after the solution cools down a little add the color solution and finally the glycerine and ammonia, which should be mixed prior to addition.

Treeing Shoes, Composition for.—Dissolve gum tragacanth in water, then add a little ink to make it black, and finally a small quantity of neatfoot oil. It must be quite thin, or else, if thick, it is liable to cake. Take of—Gum shellac,  $\frac{1}{2}$  lb.; alcohol, 2 qt. Dissolve and add—Camphor,  $1\frac{1}{2}$  oz.; lampblack, 2 oz.

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Upper Leather, Dressing for.—Over a water bath melt: oil of turpentine, 50 grams; olive oil, 100 grams; train oil, 100 grams; carnauba wax, 40 grams; asphaltum, 15 grams; oil of bitter almonds, 2 grams.

Vici Shoe Polish and Cleaner.—This class of preparations may be made to serve for either black or tan-colored leather, according to the pigment added. Soft soap, 4 dr.; linseed oil, 6 dr.; carnauba wax, 1 oz.; aniline blue, 10 gr.; aniline black, 1 dr.; oil turpentine, 2 oz.; water, 3 oz. Dissolve the soap in the water. Melt the wax in the oil and turpentine, then gradually stir in the soap solution. Stir till cold.

Waterproofing Boots and Shoes.—1.—A coat of gum copal varnish applied to the soles of boots and shoes, and repeated as it dries until the pores are filled and the surface shines like polished mahogany, will make the sole waterproof, and it lasts three times longer.

2.—Linseed oil, 1 part; mutton tallow,  $\frac{1}{2}$  lb.; beeswax,  $\frac{1}{2}$  lb. Melt and mix thoroughly together and apply to the warm dry leather with a brush. A small quantity of ivory black is sometimes added to this mixture.

3.—Rosin, 500 grams; tallow, 400 grams; fish oil, 1 l.; oil of citronella, 15 grams.

4.—Oleic acid, 8 oz.; stearic acid, crude, 2 oz.; ammonia soap (see below), 6 oz.; solution of tannin (25%), 1 oz.; iron sulphate,  $\frac{1}{2}$  oz.; water, 27 oz. Melt the acids together, and stir in gradually the ammonia soap, then the solution of tannin and 24 oz. of water, and stir the solution into the greasy mixture. This gives a black product; for tan shoes replace the iron sulphate with 2 oz. of rosin soap.

5.—Beeswax, 18 parts; spermaceti, 6 parts; spirit of turpentine, 65 parts; asphaltum varnish, 5 parts; powdered borax, 1 part; Frankford black, 5 parts; Prussian blue, 2 parts. Melt the wax and add the borax, stirring well, and heating until the mass resembles jelly. In another vessel melt the spermaceti, add the varnish, previously mixed with the turpentine, stir well, and add to the wax. Finally, add the coloring material, previously rubbed smooth with a little of the mass.

6.—Spermaceti, 3 oz.; India rubber,  $\frac{3}{4}$  oz.; tallow, 8 oz.; lard, 2 oz.; amber varnish, 4 oz.; lampblack, 1 oz. Melt the rubber in the spermaceti by a long-continued gentle heat, and add the other ingredients.

## Leather

### (Softening)

**White Canvas Shoes.**—1.—Pipeclay, 16 oz.; Spanish whiting, 8 oz.; flake white, 6 oz.; precipitated chalk, 4 oz.; powdered tragacanth, 2 dr.; carbolic acid, 2 dr.; water, q. s. to make thick paste. Mix the powders, and then add water enough to make a thick paste or cream.

2.—Bleached shellac, 1 oz.; borax, 3 oz.; hot water, 16 oz. Digest until dissolved, and then add pipeclay or prepared chalk, in fine powder, until a creamy liquid is made. The proper amount of chalk or clay to use can easily be ascertained by a trial or two, using less water and adding a little soap. A paste preparation may also be made should one be desired.

3.—Wash the canvas shoes with a little soap and water and apply with a nail brush. Use as little water as possible to remove the dirt. Then mix some pipeclay and water to a paste, apply the paste to the shoes with a rag, after cleaning; rub well, and hang shoes up to dry. When dry, beat out the superfluous clay with the hand, and rub the shoes until they look smooth.

4.—Zinc oxide, 2 av.oz.; pipeclay, 4 av.oz.; bleached shellac, 3 av.oz.; borax, 1 av.oz.; sugar, 2 av.oz.; glycerine, 1 fl.oz.; boiling water, 10 fl.oz. Dissolve the borax in the boiling water, add the shellac, continue the heat until the shellac is dissolved. Then remove from the fire, add sugar and glycerine, stir in the pipeclay and zinc.

**White Satin Shoes, To Clean.**—Put in the shoe something which will fill it out. Then rub the shoe gently with a piece of muslin, dipped in spirits of wine. Do this several times. Then wipe the shoe carefully with a piece of dry muslin.

**Silvering.** (See *Gilding or Silvering*.)

### Softening Preparations.

**Caoutchouc Grease.**—Caoutchouc, 8 parts; oil of turpentine, 8 parts; lard, 10 parts; fish oil, 50 parts; tallow, 10 parts; lampblack, 2 parts. The caoutchouc is dissolved in the warmed oil of turpentine, and the filtered solution is poured into the melted fat, which has previously been stirred up with the lampblack.

**Vaseline as a Grease and Preservative.**—Vaseline is an exceedingly valuable emollient for any kind of leather, since the very hardest leather can be softened by repeatedly rubbing in vaseline till it will not take up any more. At the same time the leather is enabled to offer greater resistance to the penetration of moisture, and is preserved from becoming brittle. Vaseline can be used on natural

### (Tanning)

leather by itself, but for black leather the following composition is recommended: Vaseline, 100 parts; lampblack, 5 parts; Prussian blue, 5 parts. A small portion of the vaseline is melted in an enameled iron pan, the lampblack and Prussian blue being added, and stirred until the mass is uniform. The rest of the vaseline is afterward stirred in by degrees.

### Straps, Polishing the Edges of.

First you will want an edge tool. If only a light single strap, a No. 1 will do, which is run down the edge to take it off and make it round. Next rub it down with fine sandpaper; then, if for brown leather, get some good harness blacking, put as much as you want to use into a cup, dissolve some oxalic acid in water, and pour in as much as will turn it a light brown, apply it to the edge of the strap, and rub it down with a clean cloth till the edge is smooth and glossy. Next you will want a screw crease (which you can procure at the tool shops), which is heated in the fire or gas till it is just hot enough to mark the leather without burning it; you can set it with the thumb-screw to any width you like, up to  $\frac{1}{2}$  or  $\frac{5}{8}$  in. Lay the strap on a flat piece of planed board; then, holding the crease firmly in the hand, you run it down the strap; alter the width for every mark or line.

### Tanning.

**Buckskin, To Tan.**—Take a skin, either green, or well soaked, and flesh it with a dull knife; spread the skin on a smooth log, and grain it by scraping with a sharp instrument; rub nearly dry over the oval end of a board held upright. Take the brains of a deer or a calf, dry by the fire gently, put them into a cloth, and boil until soft; cool off the liquid until blood-warm, with water sufficient to soak the skin in, and soak until quite soft and pliable, and then wring out as dry as possible; wash in strong soapsuds, and rub dry, and smoke well with wood smoke. Instead of brains, oil or lard may be used, and the skin soaked therein 6 hours. This is called Indian tan.

**Fur Skins.**—1.—To tan or taw skins with the hair on, for rugs and other uses, first thoroughly wash the skin and remove all fleshy matter from the inner surface; then clean the hair or wool with warm water and soft soap, and rinse well. Take  $\frac{1}{4}$  lb. each of common soap and ground alum, and  $\frac{1}{2}$  oz. of borax, dissolve in hot water, and add sufficient rye meal to make a thick paste, which

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### (Tanning)

spread on the flesh side of the skin. Fold it lengthwise, the flesh side in, the skin being quite moist, and let it remain for 10 days or 2 weeks in an airy and shady place; then shake out and remove the paste from the surface, and wash and dry. For a heavy skin a second similar application of the salt and alum may be made. Afterward pull and stretch the skin with the hands, or over a beam, and work on the flesh side with a blunt knife.

2.—After cutting off the useless parts and softening the skins by soaking in warm water, take away the fatty part from the inside, after which soak the skins in tepid water for 2 hours. Mix equal parts of borax, saltpeter and Glauber salts (sulphate of soda), in the proportion of about 1-3 oz. of each for each skin, with sufficient water to make a thin paste. Spread with a brush over the inside of the skin, applying more on the thicker parts than on the thinner. Double the skin together, flesh side inward, and place in a cool place. After standing 24 hours, wash the skin clean, and apply the following mixture in the same manner as before: Sal soda, 1 oz.; borax, 1-3 oz.; hard white soap, 2 oz.; melted slowly together, without being allowed to boil; fold together again, and put in a warm place 24 hours. After this dissolve 3 oz. of alum, 7 oz. of salt, and 1½ oz. of saleratus in sufficient hot rain water to saturate the skin; when cool enough not to scald the hands, soak the skin in it for 12 hours; wring out, and hang it up to dry. When dry, repeat the soaking and drying 2 or 3 times till the skin is sufficiently soft. Lastly, smooth the inside with fine sandpaper and pumice stone.

3.—Stretch the skin tightly and smoothly upon a board, hair side down, and tack it by the edges to its place. Scrape off the loose flesh and fat with a blunt knife, and work in chalk freely, with plenty of hard rubbing. When the chalk begins to powder, and fall off, remove the skin from the board, rub in plenty of powdered alum, wrap up closely, and keep it in a dry place for a few days. By this means it will be made pliable, and will retain the hair.

4.—Soft water, 10 gal.; wheat bran, ½ bu.; salt, 7 lb.; sulphuric acid, 2½ lb. Dissolve all together and place the skins in the solution and allow them to remain 12 hours; then remove, and clean them well, and again immerse for 12 hours, or longer, if necessary. The skins may then be taken out, well washed and dried. They can be beaten soft, if desired.

5.—Saltpeter, 2 parts; alum, 1 part.

### (Tanning)

**Mix.** Sprinkle uniformly on the flesh side, roll up, and lay in a cool place. Spread it out to dry, scrape off the fat, and rub till pliable.

**Hides for Robes.**—The hides should be very thoroughly soaked in order to get a complete softening. For dry hides this will require a longer time than for salted. A heavy hide requires longer soaking than a skin. Thus, it is impossible, says *Hide and Leather*, to fix a certain length of time. After soaking, the hide is fleshed clean, and is now ready to go into the tan liquor, which is made up as follows: Alum, 1 part; salt, 1 part; japonica, ¼ to ½ part. These are dissolved in hot water in sufficient quantity to make a 35° liquor. The hide, according to the thickness, is left in the tan from 5 to 10 days. Skins are finished in about 2 or 3 days. The hide should be run in a drum for about 2 hours before going into the tan, and again after that process. In tanning hides for robes, shaving them down is a main requisite for success, as it is impossible to get soft leather otherwise. After shaving, put back into the tan liquor again for 4, day or two, and hang up to dry. When good and hard, shave again, and lay away in moist sawdust and give a heavy coat of oil. When dry, apply a solution of soft soap; roll up, and lay away in moist sawdust again. Now run the hides on a drum or wheel until thoroughly soft. The composition of the tan liquor may be changed considerably. If the brownish tinge of the japonica be objectionable, that article may be left out entirely. The japonica has the effect of making the robe more able to resist water, as the alum and salt alone are readily soaked out by rain.

**Mats.**—1.—To prepare deerskins for mats, make a strong lather with hot water and let it stand till cold; wash the skin in it, carefully squeezing out all the dirt from the wool; wash it in cold water till all the soap is taken out. Dissolve 1 lb. each of salt and alum in 2 gal. of hot water, and put the skin into a tub sufficient to cover it; let it soak for 12 hours, and hang it over a pole to drain. When well drained, stretch it carefully on a board to dry, and stretch several times while drying. Before it is quite dry, sprinkle on the flesh side 1 oz. each of finely pulverized alum and saltpeter, rubbing it in well. Try if the wool be firm on the skin; if not, let it remain a day or two, then rub again with alum; fold the flesh sides together, and hang in the shade for 2 or 3 days, turning them over each day till quite dry. Scrape the flesh

## Leather

### (Tanning)

side with a blunt knife and rub it with pumice or rotten stone.

2.—Wash the hide in warm water, and remove all the fleshy matter from the inner surface and loose dirt from the woolly side. Now wash in strong, rather warm soap-suds. The old-fashioned soft soap, made from wood ashes, is best. Either rub by hand or gently on a washboard. As soon as thoroughly cleansed and rinsed, press as much of the water out as possible. Add the following mixture to the flesh side: Common salt and ground alum,  $\frac{1}{4}$  oz. each; borax,  $\frac{1}{2}$  oz.; dissolved in 1 qt. of hot water. When sufficiently cool to work with the hand, add enough rye meal to make a thick paste. Spread the mixture on the flesh side; fold, and let remain in a shady airy place for 2 weeks; remove the paste, and wash. They may now be dyed with any color used on woolen cloths, if so desired, being

### (Tanning)

careful not to have the dye hot enough to cook the skin. When nearly dry, scrape the flesh side thoroughly with a dull knife, and rub with the hands until the skin is soft and pliable. Comb the wool when dry.

3.—A speedier, and perhaps as reliable a method is (for 1 sheepskin): Salt, 1 lb.; alum,  $\frac{1}{2}$  lb.; saltpeter, 2 tablespoonfuls. Spread the hide out smoothly as soon as taken from the sheep. Rub the mixture well in, on the flesh side, turn the head to the tail, leaving the woolly side out, roll smoothly and closely, tie with a string, and let remain 5 days. Spread and tack it, woolly side in, against the side of an outhouse. Scrape all the flesh and grease off with a dull knife, wash with warm water and soap, using as much suds as required to remove all fatty and oily matter. While drying, rub sufficiently to keep it soft.



## CHAPTER XVIII

### LUBRICANTS

#### BRIEF SCHEME OF CLASSIFICATION

##### GENERAL INFORMATION

##### SOLID LUBRICANTS

##### LIQUID LUBRICANTS

##### MINERAL LUBRICANTS

##### SPECIAL USES

##### General Information on Lubricants.

The general experience gained of various oils used for lubricating tends to the following results:

1.—A mineral oil flashing below 300° F., 149° C., is unsafe, on account of causing fire.

2.—A mineral oil evaporating more than 5% in 10 hours at 140° F., 60° C., is inadmissible, as the evaporation creates a viscous residue, or leaves the bearing dry.

3.—The most fluid oil that will remain in its place, fulfilling other conditions, is the best for all light bearings at high speeds.

4.—The best oil is that which has the greatest adhesion to metallic surfaces and the least cohesion in its own particles. In this respect, fine mineral oils are first, sperm oil second, neatsfoot oil third, lard oil fourth.

5.—Consequently, the finest mineral oils are best for light bearings and high velocities.

6.—The best animal oil to give body to fine mineral oils is sperm oil.

7.—Lard and neatsfoot oils may replace sperm oil when greater tenacity is required.

8.—The best mineral oil for cylinders is one having sp. gr. 0.893 at 60° F., 15½° C.; evaporating point, 550° F., 288° C., and flashing point, 680° F., 360° C.

9.—The best mineral oil for heavy machinery has sp. gr. 0.880 at 60° F., 15½° C.; evaporating point, 443° F., 229° C., and flashing point, 518° F., 269° C.

10.—The best mineral oil for light bearings and high velocities has sp. gr. 0.871 at 60° F., 15½° C.; evaporating point, 424° F., 218° C., and flashing point, 505° F., 262° C.

11.—Mineral oils alone are not suited for the heaviest machinery, on account

of want of body and higher degree of inflammability.

12.—Well purified animal oils are applicable to very heavy machinery.

13.—Olive oil is foremost among vegetable oils, as it can be purified without the aid of mineral acids.

14.—The other vegetable oils admissible, but far inferior, stated in their order of merit, are gingelly, ground nut, colza and cotton-seed oils.

15.—No oil is admissible which has been purified by means of mineral acids.

16.—In the case of all lubricants it is necessary to remember that a given recipe is suitable for a certain climate only, and must be correspondingly modified to suit warmer or colder districts.

*Cleaning Lubricating Oil.*—Agitate it with a small percentage of oil of vitriol, and then thoroughly wash it with water by agitation; siphon off the oil and let stand over quicklime. To filter oil from mechanically contained impurities, fit a small cork, cut star-shaped, in the angle of a funnel, so that it will not impede the passage of liquids, and cover this loosely with cotton wool (raw cotton). If properly arranged, the oil will pass through, leaving the impurities in the cotton.

*Purifying Lubricating Oil.*—The following is a good method of purifying lubricating oil: A tub holding 63 qt. has a tap inserted close to the bottom and another about 4 in. higher. In this receptacle are placed 7 qt. of boiling water, 3½ oz. of carbonate of soda, 3¼ oz. of chloride of calcium, and 9 oz. of common salt. When all these are in solution, 45 qt. of the oil to be purified are let in, and well stirred for 5 or 10 minutes; the whole is then left for a week in a warm place, at the expiration of which time the clear, pure oil can be drawn off through the upper tap without disturbing the bottom one.

Always consult the Index when using this book.



## Lubricants

### (Solid Lubricants)

**Testing Lubricating Oil.**—To test lubricating oil for acid, dissolve a crystallized piece of carbonate of soda, about as large as a walnut, in an equal bulk of water, and place the solution in a flask with some of the oil. If, on settling, after thorough agitation, a large quantity of precipitate forms, the oil should be rejected as impure.

#### Solid Lubricants.

**Caoutchouc Lubricants.**—1.—Caoutchouc grease.—Train oil, 200 parts; caoutchouc, 20 parts. The train oil is heated in a pan until it begins to decompose, this condition being revealed by an ebullition resembling boiling, and by the evolution of a disagreeable smell, the caoutchouc, cut into small pieces, being introduced by degrees, and the entire mass vigorously stirred after each addition. For ordinary purposes, this grease is inapplicable, owing to the high price of caoutchouc, the more so because lubricants of at least equal efficiency can be prepared at a far cheaper cost.

2.—Caoutchouc and Fat Grease.—Caoutchouc, 5 parts; palm oil, 100 parts; rape oil, 100 parts; tallow, 50 parts. The caoutchouc is dissolved in the rape oil by the aid of a high temperature, and the filtered solution is incorporated with the solid fats. It has been found by experiment that actual filtration of the mass is impracticable, it being difficult to strain even through a linen cloth.

**Lead Soap Lubricants.**—The lead salts possess the property of saponifying fats or fatty oils to form fairly solid compounds, known as lead soaps, which are hard in the cold, and smeary at the ordinary temperature, but attain the necessary degree of fluidity when warmed by friction. This latter property is highly important in the case of the axles of vehicles, since it reduces the loss of grease, by dropping, to a minimum. For the preparation of these lubricants it is, first of all, necessary to make a solution of basic lead acetate, or sugar of lead, which is then incorporated with a suitable proportion of fat. The solution is prepared from sugar of lead, 10 parts; litharge, 10 parts; water, 110 parts. Boil  $1\frac{1}{2}$  to 2 hours, stirring repeatedly, at the end of which time the mass is left to rest, and the clear liquid drawn off. The latter is made up to 100 parts, by weight, by the addition of water, and after being warmed to about 120 to 140° F., is mixed with common fat (rape oil and pork fat, or neats-foot oil), in the following proportions: Sugar of lead, 100 parts; rape oil, 80

### (Solid Lubricants)

parts; pork fat, 80 parts. The resulting preparation should be of a uniform gray color, and when melted should set again at 85 to 105° F.

**Naphthalene Grease.**—Naphthalene, 100 parts; rape oil, 50 to 100 parts. The naphthalene—a crystalline hydrocarbon recovered from coal tar—is melted, and stirred up with a larger or smaller quantity of rape oil, the product varying in consistency between firm, buttery and fluid, and forming a useful lubricant. The expensive purified naphthalene is not meant here, purity not being an essential feature for the purpose in view; so that the crude article, which is very impure, is sufficient. These remarks apply equally to paraffine.

**Palm-Oil Greases, American.**—1.—Tallow, 150 parts; palm oil, 100 parts; soda, 25 parts; water, 160 parts.

2.—Tallow, 100 parts; palm oil, 160 parts; soda, 35 parts; water, 300 parts.

**Soap Greases.**—The soap greases, properly so called, are prepared with ordinary soft soap (a compound of potash with fatty acids), or from fats and potash, these forming the emulsions already referred to. Tallow, 426 parts; olive oil, 360 parts; potash, 60 parts; water, 650 parts. The potash is dissolved in water, the solution heated to boiling, and the whole of the fat is added at once, the fire being made up so as to keep the whole in a liquid state. Boiling is continued, with constant stirring, until complete saponification is indicated by the thickening of the mass and the way in which a sample will draw into threads on cooling. The resulting product is, in a chemical sense, really a dilute solution of potash mixed with an excess of fat, and may, therefore, be regarded as an emulsion lubricant in the true sense of the term.

**Solidified Oil.**—Petroleum jelly, 120 parts; ceresine wax, 5 parts; slaked lime,  $\frac{1}{2}$  part; water,  $4\frac{1}{2}$  parts. Heat petroleum jelly and wax to liquid; mix together the water and lime. Decant the jelly and wax into packing receptacle, and add lime and water, periodically stirring until it sets. For cheaper quality, use cream cylinder oil instead of petroleum jelly.

**Tallow Lubricants.**—Tallow grease is always a serviceable article, but it is somewhat dearer than other lubricants. Tallow changes in consistency very considerably according to the temperature. In the height of summer it is on a par with soft butter, but perfectly hard and friable in very cold weather.

1.—Booth's Patent Grease.—a.—Re-

## Lubricants

### (Liquid Lubricants)

finer tallow, 6 parts; palm oil, 12 parts; water, 8 parts; soda, 1 part.

b.—Refined tallow, 8 parts; palm oil, 20 parts; water, 10 parts; soda, 1½ parts.

For both recipes the tallow is melted first, and heated to about 265° F., the palm oil being stirred in. The soda is dissolved in water, in a separate vessel, either at ordinary temperature or by the aid of warmth, and the solution is run, in the form of a thin stream, into the mixture of tallow and palm oil, which is kept constantly stirred the while. After the whole of the soda has been added the fire is drawn, and the mass is stirred until it begins to set and to offer considerable resistance to the stirrers.

2.—Tallow and Neatsfoot-oil Grease.—Tallow, 100 parts; neatsfoot oil, 100 parts. This grease was used for a long time on the Württemberg railways; it is very thick, and, therefore, specially suitable for summer use; but is rather dear.

3.—Tallow, Rape-Oil and Soda Greases.—a.—Winter Grease.—Tallow, 180 parts; refined rape oil, 120 parts; soda, 20 parts; water, 360 parts.

b.—Spring and Autumn Grease.—Tallow, 230 parts; refined rape oil, 85 parts; soda, 20 parts; water, 350 parts.

c.—Summer Grease.—Tallow, 260 parts; refined rape oil, 55 parts; soda, 20 parts; water, 340 parts.

d.—French Tallow and Train-oil Grease.—Tallow 260 parts; train oil, 230 parts; soda, 23 parts; water, 500 parts.

e.—Tallow and Train-oil Grease.—Refined tallow, 2 parts; train oil, 1 part. The tallow is melted, at a moderate temperature, in a pan, and as soon as this has been done the train oil is added, the mass being crutched until a perfectly uniform mixture has been produced.

### Liquid Lubricants.

The liquid lubricants possess many important advantages over the greases, and, in consequence, are often preferred by railway companies and machinery makers. Their chief superiority is that they do not require such complicated appliances (grease boxes) in use, they begin to act as soon as they are applied, without needing the heat generated by friction to make them sufficiently fluid; and, besides, the oiling vessels can be of a simple type, even on the axles of vehicles. Finally, they exhibit the valuable feature of having their consistency less affected by the temperature of the air than is the case with greases. The best materials for the preparation of the liquid lubricants are:

### (Liquid Lubricants)

1, rape and colza oils; 2, olive oils; 3, rosin oil, either alone or in association with lime or certain products of dry distillation (paraffine); 4, train oil; 5, neatsfoot oil and bone oil; 6, the so-called mineral oils (solar oil, coal oil); 7, petroleum and ozokerite; 8, soap solutions.

*Fat and Rosin Oil.* Rosin oil is miscible with solid and liquid fats in all proportions, and the products exhibit properties corresponding to those of the components of the mixture.

1.—Rosin Oil and Train Oil Lubricant.—Rosin oil, 100 parts; refined train oil, 50 parts. Since this mixture deposits a sediment after standing for some time, it is important that it should not be used as soon as made, but should be stored in vats or casks for a while.

2.—Solar Oil Lubricant.—Solar oil, 30 parts; refined rape oil, 20 parts. This lubricating oil is particularly suitable for brass and bronze machine parts, as it does not corrode these metals to more than an appreciable extent.

3.—Thick Oil Lubricants.—a.—For winter use: Tallow, 35 parts; rosin oil, 10 parts; rape oil or olive oil, 65 parts.

b.—For summer use: Tallow, 60 parts; rosin oil, 8 parts; rape oil or olive oil, 40 parts.

*Paraffine Oil Grease.*—1.—Summer grease: Paraffine oil, 10 parts; refined rape oil, 90 parts.

2.—Winter grease: Paraffine oil, 6 parts; refined rape oil, 94 parts.

It is self-evident that these recipes can also be modified to furnish greases suitable for medium temperatures—i.e., spring and autumn use—all that is necessary being to increase or diminish the proportion of rape oil accordingly. These paraffine-oil greases, which have hitherto been insufficiently appreciated, form excellent lubricants both for axles and machinery, and can be produced cheaply wherever paraffine oil is easily obtainable. In addition to perfect lubrication they have the advantage of not corroding the machine parts.

3.—Paraffine and Vaseline Grease.—Pure white paraffine and vaseline can be mixed in any proportion by melting them together, and furnishes greases ranging in consistency from that of soft butter to thick salve, by varying the quantities. Being perfectly free from acid, they are admirably suited for fine machinery and axles, whether running at high or low speed.

## Lubricants

### (Mineral Oils)

#### Mineral Lubricating Oils.

1.—*Thick Mineral Lubricating Oils (Greases).*—These oils are prepared by boiling together milk of lime, some vegetable oil and a mineral oil until a homogeneous salve-like mass is obtained. A lime soap is formed, which dissolves in the oils; and the larger the quantity of this soap the higher the melting point of the grease. On account of this high melting point, and the viscosity of the mass when melted, these greases are specially suitable for high-pressure steam engines.

a.—Mineral oil, 100 parts; linseed oil, 30 parts; ozokerite oil, 20 parts; lime, 9 parts.

b.—Mineral oil, 100 parts; linseed oil, 30 parts; ozokerite oil, 20 parts; lime, 5 parts; magnesia, 4 parts.

c.—Mineral oil, 100 parts; linseed oil, 25 parts; ozokerite oil, 35 parts; lime, 10 parts.

d.—Mineral oil, 100 parts; rape oil, 40 parts; cocoanut oil, 10 parts; lime, 10 parts.

e.—Mineral oil, 100 parts; rosin oil, 100 parts; rape oil, 50 parts; linseed oil, 75 parts; lime, 25 parts.

f.—Mineral oil, 100 parts; rape oil, 30 parts; ozokerite oil, 20 parts; lime, 15 parts.

2.—*Lanoline Axle Grease.*—a.—Rape oil, 10 parts; quicklime, 5 parts; water, 20 parts; crude vaseline, 500 parts; crude lanoline, 40 parts.

b.—Linseed oil, 10 parts; quicklime, 5 parts; water, 20 parts; crude vaseline, 600 parts; crude lanoline, 40 parts.

The last two formulas mentioned above are mixed with clay, soapstone or infusorial earth, in the proportion of 10 to 25% of the whole mass.

3.—*Lanoline Lubricant.*—In scouring sheep wool, a product known as wool fat, wool yolk, or suint, is obtained, and this in turn furnishes lanoline, or wool oil. Lanoline, when quite pure, is a soft mass of fatty character, but is not a fat, and therefore never turns rancid, so that it forms an excellent lubricant. It is particularly adapted for axle grease, only the crude lanoline being, of course, used for this purpose. The method of preparation adopted consists in heating some vegetable oil with milk of lime and crude vaseline until a homogeneous mass is obtained melted lanoline being then added in a thin stream, and stirred with the rest until the product has attained the consistency of soft salve. The mass may be stiffened to any desired extent by the

### (Axle Grease)

addition of ground soapstone, clay or infusorial earth.

4.—*Paravaseline.*—Lubricants of greater fluidity can be easily obtained by mixing vaseline with petroleum; and, conversely, thicker lubricants can be prepared by the addition of crude paraffine or ozokerite. Paravaseline, for instance, is compounded of vaseline and paraffine. Generally, these lubricants are colored by means of cheap coloring matters: colothar for red, umber for brown, and so on.

5.—*Soap and Vaseline Greases.*—a.—Crude vaseline, mixed with ordinary or rosin soap, furnishes a very good railway grease, green to brown in color. Crude vaseline, 6 to 8 parts, melted along with 1 part of tallow and 1 part of colophony,  $1\frac{1}{2}$  parts of soda lye ( $20^{\circ}$  B $\acute{e}$ .) being poured in as a thin stream, and the whole stirred continuously until the mass begins to get viscous, whereupon it is poured into cans, drums, etc., for sending out.

b.—Tallow,  $1\frac{1}{2}$  parts; crude palm oil, 3 parts; solution of carbonate of soda,  $15^{\circ}$ ,  $1\frac{1}{2}$  parts; melt.

#### LUBRICANTS FOR SPECIAL PURPOSES

##### Axle Grease.

In making axle grease for cold countries, the proportion of train oil must be increased to give the grease the necessary fluidity. The larger the quantity of train oil the softer, more buttery, and more easily melted the mixture will be. The following is a recipe for a thick oil grease:

1.—For use in winter: Tallow, 35 parts; oil of rosin, 10 parts; olive or rape oil, 65 parts.

2.—For use in summer: Tallow, 60 parts; oil of rosin, 8 parts; olive or rape oil, 40 parts.

The blue color is due to the dark violet tint of the oil referred to, while the yellow tint is produced by the addition of a solution of turmeric root in caustic soda.

*Asphaltum Axle Grease.*—Asphaltum, 32 parts; black pitch, 8 parts; petroleum, 8 parts; litharge, 8 parts; water, 80 parts. The asphaltum and pitch are first melted together in a pan, the petroleum being then added until the mass has become uniformly fluid. The litharge is next added, and finally the water is run in, in small quantities, the whole being stirred until perfectly uniform. The asphaltum and pitch give this grease a lustrous black color and a peculiar bituminous smell. The fluidity of the mass can

## Lubricants

### (Axle Grease)

be increased or diminished by correspondingly varying the proportion of petroleum.

**Car Axles.**—Dark ozokerite, 15 parts; heavy petroleum, 3 to 6 parts. Melt together at a gentle heat. Suitable also for heavy wagons.

**Carriage Axle Greases.**—1.—Tallow, 500 parts; linseed oil, 500 parts; pine rosin, 500 parts; caustic soda lye, 315 parts.

2.—Tallow, 500 parts; linseed oil, 450 parts; pine rosin, 500 parts; caustic soda lye, 500 parts.

Both preparations, when suitably stirred during preparation, form solid masses, of the constituency of salve, and yellow in color. They are easily distributed on the axles, and lubricate well. The rosin is melted first, the tallow and linseed oil being then added; and when these have formed a uniform mixture, the caustic soda lye is added by degrees. The lye is used moderately strong, and the firmness of the grease can be heightened by increasing the concentration of the alkaline solution.

**Caoutchouc Axle Grease.**—Palm oil, 20 parts; train oil, 100 parts; caoutchouc, 2 parts; litharge, 2 parts; sugar of lead, 2 parts. The caoutchouc is cut into small pieces, and heated, with the train oil, to about 390° F., the litharge and sugar of lead being then added, and the heating continued for an hour longer. Finally, the palm oil is stirred into the still hot mass.

**Frazier's Axle Grease.**—Composed of partially saponified rosin oil, that is a rosin soap and rosin oil. In its preparation  $\frac{1}{2}$  gal. of No. 1 and  $2\frac{1}{4}$  gal. of No. 4 rosin oil are saponified with a solution of  $\frac{1}{2}$  lb. of sal soda dissolved in 3 pt. of water, and 10 lb. of sifted lime. After standing for 6 hours or more, this is drawn off from the sediment and thoroughly mixed with 1 gal. of No. 1,  $3\frac{1}{2}$  gal. of No. 2, and 4-2-3 gal. of No. 3 rosin oil. This rosin oil is obtained by the destructive distillation of common rosin, the products ranging from an extremely light to a heavy fluorescent oil, or colophonic tar.

**Graphite Axle Grease.**—Tallow, 36 parts; pork fat, 9 parts; palm oil, 9 parts; graphite, 2 parts.

**Graphite Grease for Quick-Running Axles.**—Tallow, 100 parts; graphite, 100 parts. This is specially suitable for greasing the shafts of circular saws, ventilating fans, etc., and, indeed, for any axles running at high speed under small load.

**Palm Oil Axle Greases for Very Heavy**

### (Axle Grease)

**Wagons.**—1.—For winter use: Tallow, 420 parts; palm oil, 840 parts; soda, 140 parts; water, 4,200 parts.

2.—For summer use: Tallow, 420 parts; palm oil, 490 parts; soda, 35 parts; water, 2,300 parts. The above are calculated for severe winter weather and high summer temperatures. For milder winter climates the proportion of soda may be somewhat reduced and the palm oil increased.

**Quick-Running Axles.**—1.—Soap, 1 part; rape oil, 1 part; water, 5 parts; powdered talc, 2 parts.

2.—Brown ozokerite, 10 parts; petroleum, 4 parts.

In the case of No. 1, the ingredients are mixed by boiling and stirring them together, while for No. 2 melting together is sufficient.

**Railway Axles.**—In a small boiler, dissolve from 56 to 60 lb. of soda in about 3 gal. of water. In a 60-gal. boiler, melt tallow, and to it add palm oil, each in quantity according to season.

1.—In summer weather: Tallow, 1 cwt. 3 qr.; palm oil, 1 cwt. 1 qr.

2.—In winter: Tallow, 1 cwt. 1 qr.; palm oil, 1 cwt. 3 qr.

3.—In spring or autumn: Tallow, 1 cwt. 2 qr.; palm oil, 1 cwt. 2 qr. As soon as the mixture boils, put out the fire, and let the mixture cool down gradually, frequently stirring it while cooling. When reduced to blood heat run it off through a sieve into the solution of soda, stirring it well, to insure a perfect mixture of the ingredients.

4.—Austrian Railway Grease.—a.—Winter: Tallow, 10 parts; olive oil, 20 parts; old grease, 13 parts.

b.—Spring and autumn: Tallow, 100 parts; olive oil, 10 parts; old grease, 10 parts.

c.—Summer: Tallow, 100 parts; olive oil, 1 part; old grease, 10 parts.

5.—English Railway Axle Grease.—a.—Summer: Tallow, 504 lb.; palm oil, 280 lb.; sperm oil, 22 lb.; caustic soda, 120 lb.; water, 1,370 lb.

b.—Winter: Tallow, 420 lb.; palm oil, 280 lb.; sperm oil, 35 lb.; caustic soda, 126 lb.; water, 1,524 lb.

6.—French Lard.—Dissolve 3 oz. of shredded india-rubber in 1 gal. of finest rape-seed oil by the application of heat.

7.—German Railway Grease.—Tallow, 24.60%; palm oil, 9.80%; rape-seed oil, 1.10%; soda, 5.20%; water, 59.30%.

**Sulphur Axle Grease.**—Refined tallow, 2 parts; train oil, 2 parts; powdered sulphur, 1 part. The tallow is melted, heated to about the boiling point of water,

## Lubricants

### (Cart Grease)

and the train oil is added. The fats are mixed by vigorous crutching, and the powdered sulphur is thrown in. The whole is then kept for another 10 minutes at the above temperature, after which the fire is drawn and the mixture is stirred until it has set to a perfectly homogeneous, buttery mass. It is important that the sulphur should not be added in any other form than that of a very fine floury powder, since larger fragments of sulphur would not give a uniform product.

**Wooden Axles.**—Put 10 lb. of quicklime into a tub, and pour water over to just cover well. Let stand a day or two, stirring occasionally. Strain, or pass through a fine sieve. Mix in 15 qt. of common rosin oil, and let stand one day. Pour off the water, then add 10 gal. of coal-tar-grease-oil and 10 lb. of plumbago. Heat the whole gently until amalgamation takes place.

### Belting Grease.

1.—To 100 parts of castor oil add 10 parts of tallow. Belts lubricated with this mixture are made flexible, and the friction on the pulleys is increased.

2.—Linseed oil, 9 parts; litharge, 4 parts. Boil together, along with water, until a sample sets to the consistency of plaster, the mixture being then thinned down with oil of turpentine while still warm.

3.—**Driving-Belt Grease.**—a.—Linseed oil, 45 parts; litharge, 20 parts; water, 20 parts. These three substances are boiled together until the mass has assumed the consistency of plaster, and is thinned to about the same degree of fluidity as varnish, by adding oil of turpentine in the warm.

b.—**Caoutchouc Grease for Driving Belts.**—(1) Caoutchouc, by weight, 500 parts, dissolved in an equal weight of oil of turpentine at 122° F., and mixed with 500 parts of colophony and 500 parts of yellow wax. (2) Fish oil, 1½ parts, melted with 500 parts of tallow, and the mixture is stirred with solution (1) until the mass sets. The grease is laid on the belts with a brush, in the vicinity of a hot stove.

### Cart Grease.

**Palm-Oil Cart Grease.**—Palm oil, 210 parts; tallow, 85 parts; soda lye, 65 parts; water, 920 parts. The palm oil and tallow are melted together, the mixture rendered uniform by stirring, and the soda lye added. The density of the latter should be 20 to 21° Bé.; that is to say, the Baumé areometer should sink

### (Clockmakers' Oils)

into the solution down to the 20 or 21° mark on the scale. After the soda lye has been stirred in the water is added, and the mass is stirred until uniform, whereupon it is ladled out into vessels to set.

### Chain Lubricant.

A mixture of powdered plumbago and glycerine has been warmly recommended at various times as a chain lubricant. Plumbago, 6 parts, mixed intimately with 10 parts of petrolatum, also yields a satisfactory lubricant. (See also Cycle Oil.)

### Clockmakers' Oils. (See also Watch Oils.)

Lubricants for clocks and delicately constructed machinery in general, are usually prepared from very carefully refined rape oil, or, preferably, fine olive oil. To remove the final traces of acid from the oil it is shaken with 1% by weight of caustic soda, this being repeated several times daily for 2 or 3 days. A large volume of water is then added, and the supernatant oil, which is now quite free from acid, is poured off. It, however, still contains coloring matters and certain other constituents inimical to lubrication, and to remove these the oil is shaken up with strong alcohol, which dissolves them out. For this purpose, 10 parts by volume of the oil are placed in a clear glass bottle holding about one-third as much again, along with 2 parts of 90% alcohol. The bottle is next well corked, and shaken up so as to thoroughly mix the oil and the spirit. The bottle is set out in the sun, and shaking repeated several times a day. At the end of about 3 weeks—though in bright summer weather 10 to 14 days often suffice—the oil will be water-white, the supernatant layer of spirit having assumed a strong yellow tinge through the coloring matter absorbed from the oil. The purified oil is syphoned off and filled at once into small, tightly corked glass bottles, which should be kept in a cool, dark place. The spirit can be recovered by careful distillation, in a perfectly colorless condition, and used over again.

**Fatty Oil for Clocks.**—For oiling clocks, the cost of the oil is a relatively unimportant consideration, experience showing that clockmakers and all other makers of the more delicate kinds of machinery will readily pay very high prices for a lubricating oil that will meet their requirements. Lubricants for this purpose must, first of all, have no chemical action on metals, and must not thicken or "gum" in course of time.

## Lubricants

### (Cylinder Oil)

**Mineral Oil for Clockmakers' Use.**—The mineral oil for clockmakers' use is a specially refined heavy tar oil. One hundred parts of ordinary heavy tar oil are treated with 2 parts of bleaching powder, well stirred in, and followed by 3 parts of crude hydrochloric acid. The mixture must then be vigorously stirred, and set aside for 6 hours. At the end of this time the oil is poured off from the watery liquid, and repeatedly shaken up with 5 parts of caustic soda lye each time. Finally, the refined oil is filtered through gray blotting paper.

**Olive Oil for Clockmakers' Use.**—To prepare this lubricant, an olive oil must be taken that has been refined by the sulphuric-acid method, very well known, and afterward shaken up with about 2% of weak lye to insure the complete elimination of the final traces of free acid. The oil and lye are left in contact for several days after a thorough shaking, the oil floating on the surface being then drawn off and bleached with spirits, as described above. Like all other fine lubricating oils, the olive oil so treated must be filled into small bottles, which are then tightly corked, and stored with care.

### Cog-wheel Grease.

Any convenient buttery lubricant is melted and stirred up with 5% by weight of finely ground and levigated powdered glass. In a short time this lubricant polishes the cogwheel teeth perfectly smooth and even.

### Cycle Oil.

1.—This is commonly made up of sperm oil and vaseline, 3 parts of the former to 1 part of the latter, by weight. A greater quantity of vaseline could be used, and some mineral oil as a thinning agent.

2.—**Cycle-Chain Lubricant.**—a.—Melt some tallow (Russian for preference), then stir in powdered plumbago (graphite or black lead) until it is thick enough to set solid when cold. While fluid pour it into molds.

b.—The foregoing recipe applies to blocks of hard lubricant that is rubbed on the chain. If the chain can be soaked and stirred about in the fluid mixture, it is much better.

c.—Mix plumbago and vaseline to a stiff consistency. This does not set, but is applied with a brush.

### Cylinder Oil.

Filtered cylinder oil, 3 parts; black cylinder oil, 2 parts; thickened rape oil, 1

### (Hemp Ropes)

part. Heat to 200° F. in a steam-jacketed pan for half an hour, stirring well. When settled, it can be run into barrel while warm. If desired, half the rape oil can be omitted and this quantity of lard oil added. What is known as A and B blend consists of 9 parts of steam-refined cylinder oil, 3 parts of thickened rape oil and 3 parts of lard oil. This A blend The B blend consists of 9, 4 and 4 parts respectively.

### Drill Lubricator.

For drilling wrought iron, use 1½ lb. of soft soap mixed with 1½ gal. of boiling water. Insures ease in working, and clean cutting.

### Dynamo Oil.

Refined cocoanut oil, 1 part; 0.885 mineral oil, 1 part; 0.908 mineral oil, 2 parts. Put the cocoanut oil in a steam-jacketed pan, then run in the mineral oils. Heat to 170° F., and put on blower for about ¼ hour. Stop the heat, and let settle; it is then finished. The mixture forming this lubricant can be varied by increasing the proportion of cocoanut oil up to double that given above.

### Gear and Pinion Grease.

The Detroit United Railways is using on its cars a gear and pinion "dope" grease that is giving very satisfactory service. Through use the cost of lubricating gears has been reduced 56 to 80 cents per 1,000 miles, and the cost of lubricating pinions 32 to 40 cents per 1,000 miles. About 25 lb. of the lubricant is packed in each gear case. The ingredients and the proportions used in mixing this dope are as follows: Animal fat (tallow and lard), 18%; oleic acid, 3%; lime, 3%; Dixon's best graphite, 8%; special paraffine stock, 48%; 650 fire cylinder stock, extremely viscous, 20%.

### Hemp Ropes.

Cut a quantity of tallow into small pieces, and place the latter in a clean vessel on a moderate fire. When melted, run the liquid fat through a wire sieve into another vessel, in which mix, with constant stirring, 1-5 part, by weight, of hot linseed-oil varnish, taking care that it is thoroughly incorporated. To this mixture add 1-15 part of vaseline. After cooling, this grease is applied by means of a wooden spatula on the rope, and rubbed in with a clean woolen rag. The grease should preferably be lukewarm when rubbed in.

## Lubricants

### (Machinery)

#### **Machine Oils and Solid Greases, American.**

A number of these products have been found, on careful examination, to possess the following composition:

- 1.—Oleic acid, 90 parts; petroleum, 10 parts.
- 2.—Oleic acid, 100 parts; glycerine, 50 parts.
- 3.—Oleic acid, 100 parts; guaiacum oil, 20 parts.
- 4.—Glycerine, 100 parts; petroleum, 10 parts.
- 5.—Glycerine, 100 parts; olive oil, 50 parts.
- 6.—Gamber fat, 100 parts; coal tar, 30 parts.

#### **Machinery Lubricants.**

- 1.—Graphite, 28 parts; talc, 20 parts; sulphur, 16 parts; wax or paraffine, 16 parts.
- 2.—Graphite, 15 parts; bone glue, 7½ parts; water, 16 parts; sulphur, 6 parts; wax or paraffine, 5½ parts. A patent has been taken out in France for lubricants compounded in this manner.
- 3.—*Chard's Preparation for Heavy Bearings* consists of: Petroleum (gravity 25°), 12 oz.; caoutchouc, 2 oz.; sulphur, 2 oz.; plumbago, 4 oz.; beeswax, 4 oz.; sal soda, 2 oz. The composition is stirred and heated to 140° F. for half an hour.
- 4.—*Booth's*.—Soda, ½ lb.; rape-seed oil, 1 gal.; water, 1 gal.; tallow or palm oil, ½ lb.; mix intimately, heat to boiling, and continue stirring till cooled down to 60 to 70° F. (15½ to 21° C.).
- 5.—Boiling water, 4 gal.; Scotch soda, ½ lb.; mixture of palm oil and tallow in any proportions, 10 lb.; treat as 4.
- 6.—Scotch soda, 10 lb.; glue, 1 lb., dissolved in 10 gal. of water; oil, 10 gal.; india-rubber, 4 lb., dissolved in oil of turpentine; add the india-rubber last, and stir the whole thoroughly.
- 7.—Lard, 2½ lb.; camphor, 1 oz.; graphite (black lead), ½ lb. Rub up the camphor into a paste with part of the lard in a mortar, add the graphite and the rest of the lard, and intimately mix.
- 8.—Dissolve 2¼ lb. sugar of lead (lead acetate) in 16 lb. melted but not boiling tallow, and add 3 lb. black antimony, stirring the mixture constantly till cold. For cooling necks of shafts.
- 9.—*Caoutchouc Machine Grease*.—Caoutchouc, 20 parts; linseed oil, 1,000 parts. 20 parts each of caoutchouc and linseed oil are first melted together, another 20 parts of oil stirred in as soon as the mixture begins to disengage vapor.

### (Sewing Machine Oil)

Subsequently the rest of the linseed oil is added, 100 parts at a time.

10.—*French's Machine Grease*.—Petroleum, 500 parts; graphite, 44 parts; beeswax, 1½ parts; tallow, 4½ parts; caustic soda, 1½ parts. These are mixed together at a boiling heat.

11.—*Hendrick's* lubricant is prepared from whale or fish oil, white lead and petroleum. The oil and white lead are, in about equal quantities, stirred and gradually heated to between 350 and 400° F., then mixed with a sufficient quantity of the petroleum to reduce the mixture to the proper gravity.

12.—*Munger's* preparation consists of: Petroleum, 1 gal.; tallow, 4 oz.; palm oil, 4 oz.; plumbago, 6 oz.; soda, 1 oz. These are mixed and heated to 180° F. for an hour or more, cooled, and, after 24 hours, well stirred together.

#### **Piston-rod Grease.**

Paraffine, 1 part; powdered talc, 4 parts, are stirred together whilst hot, wicks are then dipped in the mixture, and are afterwards pressed into position in the piston-rod gland. This lubricant will grease a piston rod for 8 to 14 days with one application.

#### **Sewing Machine Oil.**

- 1.—A mixture of: Olive oil, 3 parts; almond oil, 2 parts; rape oil, 1 part, is treated with alcohol as already described. This mixed lubricant is fairly fluid, and is therefore admirably suited for oiling very fine machine parts.
- 2.—Best.—Pale oil of almonds, 9 oz.; rectified benzoline, 3 oz.; foreign oil of lavender, 1 oz. Mix and filter.
- 3.—Common.—Petroleum, 3 oz.; pale nut oil, 9 oz.; essential oil of almonds, 40 to 50 drops. Mix and filter.
- 4.—The writer was given a simple recipe of 2 parts of sperm oil and 1 part petroleum. He made a quart of this for domestic use, and it answered excellently. Through not having a great use for it, the quantity made was not finished for about 12 years, and at the expiration of this time the oil was as good as at first, though a little darker in color.
- 5.—Sperm oil, to which a little kerosene oil has been added, makes a very satisfactory lubricant for sewing machines and other light machinery.
- 6.—Soft paraffine, 1 part; paraffine oil, 7 parts. Melt the soft paraffine and add the oil. Allow to stand for some hours, and then pour off the liquid.

## Lubricants

### (Watch Oils)

#### Turbine Oils.

	I.	II.	III.	IV.
Yellow rosin oil....	200	200	40	40
Blue rosin oil.....	..	33	..	..
Olive oil.....	1	..	40	..
Rape oil.....	..	33	..	..
Olein.....	..	..	60	..
Cotton seed oil.....	..	..	..	30
Paraffine oil.....	..	..	..	30

These oils are suitable for all quick running shafts or axles under light loads.

#### Watch Oils. (See also Clockmakers' Oils.)

An oil fit to be used as a lubricator for fine mechanism should possess the following essential qualities: It should neither thicken nor dry up nor get hard at a low temperature, nor should it be subject to oxidation. In spite of the vast progress natural science has made of late years, it has not succeeded in discovering an animal or vegetable oil possessing these combined properties without previous artificial manipulation. Let us mention a few instances:

1.—Almond oil has the valuable property of not becoming firm till below 17° R., but it oxidizes sooner than any other oil.

2.—Poppy seed oil will withstand cold to 15° R. and preserves itself well from oxidation, but it is one of the drying oils and therefore useless as a watch oil.

3.—Olive oil, up to the present the most useful among watch oils, does not dry or thicken, nor does it oxidate for a comparatively long time, but it hardens at 2° R.

4.—The properties of neatsfoot oil are similar to those of olive oil, but it exceeds the latter in resistance against oxidation.

5.—Put 1 oz. of pure olive oil in a tumbler, add 2 oz. of 96° alcohol, stirring well; set it away in a dark place for 24 hours or more, well covered, then pour into a clean bottle containing 10 oz. distilled or clean rain water; shake violently for 5 minutes, allow the mixture to stand a ½ hour or so, then freeze with salt and ice. You can find a good article of fine limpid watch oil, perfectly fluid at top. Draw off with a siphon. Be careful not to break the bottle in freezing.

6.—Olive oil containing a strip of clean lead is exposed to the sun in a white glass vessel till all deposit ceases, and the supernatant oil is limpid and colorless.

#### Wire Ropeways.

1.—Tar, 100 parts; brewer's pitch, 100 parts; colophony, 25 parts; train oil, 10

### (Wood Lubricants)

to 25 parts, are melted together and stirred until the mass is cold.

2.—For the lubrication of wire ropes use a mixture of mica, axle grease, tar, and summer oil. According to the *Engineering and Mining Journal* this is unpatented, and can be made of any desired consistency. The tar and oil must be free from acid. It is claimed that it thoroughly penetrates between the wires, prevents rust, and fills the cable, resists water, does not strip, and is very economical if added sparingly, as all lubricants should be, after the first dose. It goes without saying that cables well taken care of will last very much longer than neglected ones; besides which, there is the far more important matter of safety in mine hoists to be considered, one condition of this being the clean state of the interior wire surfaces.

#### Wood, Lubricants for.

1.—Wood screws or any wood surfaces that rub can be successfully lubricated with plain plumbago (black lead). It can be applied mixed with water to the consistency of paint, or it will do if it can be dusted on dry.

2.—To a quantity of good lard, rendered semi-fluid (but not liquid) by gentle heat in an iron pan, is gradually added 1½ part by weight of finely powdered and sifted graphite (black lead), with careful and continued stirring until the mass is homogeneous and smooth; the heat is then steadily increased till the compound liquefies, when it is allowed to cool, the stirring having been meanwhile kept up unceasingly.

3.—Tallow, 8 lb.; palm oil, 10 lb.; graphite (black lead), 1 lb.

4.—Lard, 2½ lb.; camphor, 1 oz.; graphite (black lead), ½ lb. Rub up the camphor into a paste with part of the lard in a mortar, add the graphite and the rest of the lard, and intimately mix.

#### Wooden Machinery, Palm Oil Grease for.

Tallow, 30 parts; palm oil, 20 parts; train oil, 10 parts; graphite, 20 parts. The fats are melted by moderate warmth, and the graphite, which has been reduced to the finest powder and then levigated, is intimately mixed therewith by protracted stirring. In respect of the quantities consumed, the palm oil greases may be regarded as the most important of all lubricants, since they are employed, to the exclusion of all others, on many railways, and are often used for large machines as well.





## CHAPTER XIX

# PAINTS, VARNISHES, BRONZING, LACQUERS, STAINS, SIZES, DRIERS, WHITEWASHES, ETC.

### BRIEF SCHEME OF CLASSIFICATION

BRONZING  
DRIERS  
ENAMEL PAINTS  
FILLERS  
JAPANS AND JAPANING  
LACQUERS AND LACQUERING

PAINTS  
SIZE  
STAINS  
VARNISHES  
WHITEWASH

The subject of paints, pigments, varnishes, japans and lacquers offer peculiar difficulties when it comes to classification. Where does a varnish begin and a lacquer end? This is a question which is almost impossible to answer. The classification in this book is based on certain well-known distinctions and is perhaps sufficiently accurate for the ordinary user. A series of definitions from the Century Dictionary may, however, not come amiss, but as has already been remarked, the line of demarcation between the various classes of paints, etc., is not well marked.

**Drier.**—An substance added to a paint to increase its drying qualities. It may be a liquid, such as japan, or a dry material, as oxide of lead, oxide of manganese, burnt umber or sugar of lead.

**Japan.**—A liquid having somewhat the nature of a varnish, made by cooking gum shellac with linseed oil in a varnish kettle. Litharge or some similar material is also usually added to quicken the drying of the resulting japan.

**Lacquer.**—An opaque varnish containing lac, properly so called. Especially the kind of varnish consisting of shellac dissolved in alcohol, with the aid of other ingredients, particularly coloring matters. It is also applied to different materials to protect them from tarnishing and to give them luster, especially to brass.

**Paint.**—A substance used in painting, composed of a dry coloring material intimately mixed with a liquid vehicle. It differs from a dye in that it is not designed to sink into the substance to which it is applied, but to form a superficial coating.

**Pigment.**—Any substance that is or can

be used by painters to impart color to bodies; technically, a dry substance usually in the form of powder or in lumps so lightly held together as to be easily pulverized, which, after it has been mixed with a liquid medium can be applied by painters to surfaces to be colored. Pigment is properly restricted to the dry coloring matter which, when mixed with a vehicle, becomes a paint, but the two words are commonly used without discrimination.

**Siccative.**—In painting, any material added to an oil paint to hasten the drying of the oil; a dryer. Siccative is more of a book word, dryer being the term commonly used by painters.

**Stain.**—To color by a process other than painting or coating or covering the surface. (a) To color (as glass) by something which combines chemically with a substance to be colored. (b) To color by the use of a thin liquid which penetrates the material, as in dyeing cloth or staining wool.

**Varnish.**—A solution of resinous matter, forming a clear, limpid fluid capable of hardening without losing its transparency; used by painters, gilders, cabinet makers and others for coating over the surface of their work in order to give it a shining, transparent and hard surface, capable of resisting, in a greater or less degree, the influences of air and moisture.

### BRONZING

1.—Copper powder is obtained by saturating nitrous acid with copper, and then precipitating the copper by exposing iron bars in the solution.

2.—Dutch foil, reduced to a powder by grinding, is also used, and powdered plumbago gives an iron-colored shade.

Always consult the Index when using this book.

## Paints, Varnishes, Etc.

### (Bronzing)

3.—Another kind is made from verdigris, 8 parts; putty powder, 4 parts; borax, 2 parts; bichloride of mercury,  $\frac{1}{4}$  part; grind into a paste with oil and fuse them together.

4.—Another (red): Sulph. copper, 100 parts; carb. soda, 60 parts; mix and incorporate by heat; cool, powder, and add copper filings, 15 parts; mix; keep at a white heat for 20 minutes; cool, powder, wash and dry.

*Aniline Bronzing Fluid.*—Take 10 parts of aniline red and 5 parts of aniline purple and dissolve in 100 parts of alcohol at 95°, taking care to help the solution by placing the vessel in a sand or water bath. As soon as the solution is effected, 5 parts of benzoic acid are added, and the whole is boiled from 5 to 10 minutes until the greenish color of the mixture is transformed into a fine light-colored bronze. This bronze is stated to be very brilliant, and to be applicable to all metals, as well as to other substances. It is easily laid on with a brush, and dries promptly.

*Application.*—Go over the part you intend to bronze with gold size or varnish. When it is sufficiently dry—that is, when it does not adhere to the finger, but feels clammy—dip a piece of cotton, rolled into a hard ball, in your bronze powder, and dab it on the place to be bronzed.

#### *Banana Oil for Bronzing Solutions.*

This oil, so named on account of the odor imparted by its amyl acetate constituent, seems to have no definite formula, but to vary in composition according to the ideas of those who prepare it. This is usually a mixture of equal parts of amyl acetate, acetone and benzine, with just enough pyroxylin dissolved therein to give the finished product sufficient body and to leave a protective covering after the liquids have evaporated. A solution of 1 gram of celluloid in 25 c. c. of amyl acetate is sometimes sold for banana oil. This "oil," and its vapor, it should be remembered, are quite inflammable.

*Gold Paint.*—1.—Do not mix the gold size and powder together, but go over the article to be gilded with the size alone, giving an even and moderate coating. Let it dry, which will not take long, till it is just sticky, or as gilders call it, tacky. Then over a sheet of smooth writing paper dust on the dry gold powder by means of a stout, soft, sable brush.

2.—Bisulphide of tin has a golden luster, flaky texture, and is used for or-

### (Bronzing)

namental work, such as paper hangings, and as a substitute for gold leaf.

3.—Gold Bronze Powder. a.—Pure gold bronze powder may be made as follows: Grind leaf gold with pure honey until the leaves are broken up and minutely divided. Remove this mixture from the stone by a spatula and stir up in a basin of water; the water will melt the honey and set the gold free. Leave the basin undisturbed until the gold subsides. Pour off the water and add fresh instead, until the honey is entirely washed away, after which collect the gold on filtering pans and dry for use. b.—A cheaper sort may be made thus: Melt 1 lb. of tin in a crucible and pour it on  $\frac{1}{2}$  lb. of pure mercury; when this is solid grind it into powder with 7 oz. of flowers of sulphur and  $\frac{1}{2}$  lb. of sal ammoniac.

4.—Gold Enamel Paints.—The "greening" of the vehicle, which is very objectionable and unsightly, is set up by free acid in the medium, and as these bronzes are very readily attacked by acids, this is the reason of this greenish appearance developing, as chemical reaction takes place. It may be overcome by neutralizing any acid in the liquid used as a binder by the addition of lime, etc., as in the Bessemer paint, for which the recipe following is a modern formula, yet little different from the original:

a.—Pure turps, 6 pt.; copal varnish, 1 pt.; good gold bronze,  $6\frac{1}{2}$  lb.; calcis hydrate (dry-slaked lime),  $\frac{1}{2}$  oz. Mix the varnish and turps at a gentle heat, then slake well with the lime, and settle for a few days, then pour off the clean portion and mix with the powder.

b.—White hard varnish, 1 gal.; methylated spirit,  $\frac{3}{4}$  gal.; gold bronze, 12 lb.; finely powdered mica, 3 oz. Mix the varnish and the spirit, reduce the mica to an impalpable powder, mix with the gold, then add to the liquid. Many bronze powders contain a goodly proportion of mica, as it imparts brilliancy. Powdered mother of pearl is used also.

c.—Benzole, 5 gal.; white hard varnish, 1 gal.; sheet gutta percha, 2 lb.; bronze powder, 34 lbs. Finely shred the gutta percha and dissolve in the benzole, then mix with the others.

d.—Amylic alcohol, 1 gal.; amyl acetate, 1 gal.; gold bronze, 10 lb.; celluloid chips, 9 oz.; camphor, 4 oz.

*Mosaic Gold.*—Mosaic gold is prepared by incorporating and grinding: Tin, 16 parts; flower of sulphur, 7 parts; mercury, 8 parts; sal ammoniac, 8 parts; then subliming the amalgam. A flaky

## Paints, Varnishes, Etc.

### (Driers)

gold-colored powder remains in the mass.

**Powder.**—Bronze powder may be mixed into a paint by using japan drier with a small percentage of boiled linseed oil. Both should be fresh.

**Silver Bronze Powder.**—Melt together 1 oz. each of bismuth and tin, then add 1 oz. quicksilver, cool and powder.

### DRIERS

There are several kinds of driers, but the best usually have litharge or sugar of lead as the important "drying" agent. Litharge is best for dark and middle tints, while sugar of lead is better suited for light tints.

1.—For a liquid drier, boil 1 qt. of linseed oil for 1 hour with 1 lb. finely powdered binoxide of manganese. For a solid drier use borate of manganese in powder, or mixed with oil.

2.—A good drier for paints is made by grinding or dissolving a small quantity of sugar of lead in linseed oil.

3.—Drier for Oil Colors and Varnishes. —Water, 100 parts; gum lac, 12 parts; borax, 4 parts.

4.—Driers (Painters').—Litharge (best) ground to a paste, with drying oil. For dark colors.

5.—White copperas and drying oil. As the last.

6.—Sugar of lead and drying oil. The last two are for pale colors.

7.—White copperas and sugar of lead, of each 1 lb.; pure white lead, 2 lb. For "whites," and opaque light colors, grays, etc. Driers are employed, as the name implies, to increase the drying and hardening properties of oil paints. A little is beat up with them at the time of mixing them with the oil of turpentine for use.

8.—Concerning concentrated and liquid driers, Livache states in *Les Corps Gras Industriels*, that concentrated siccatives are produced by heating linseed oil with 10 to 70% of litharge, red lead, or manganese borate to 250 to 300° C. In lieu of the above-named compounds, one may also employ lead acetate or zinc oxide. The concentrated driers thus obtained are thick, semi-liquid, brown masses, and serve for the production of varnishes from linseed oil by the cold process. Liquid driers are prepared in the same way, with the exception that they are diluted with turpentine oil after a short removal of the vessel from the fire and filtered. Take, for instance: Linseed oil, 7 kgm.; litharge, 2 kgm.; manganese dioxide, 2 kgm.; red lead, 1 kgm.; oil turpentine,

### (Driers)

14 kgm. Or for white liquid drier: Linseed oil 7 kgm.; manganese borate, 2 kgm.; lead acetate, 1½ kgm.; oil turpentine, 13 kgm. In boiling the latter kind, a white mass is obtained instead of a red one, which, however, slowly turns yellowish. For white paint the solid driers are preferred; in the case of other oil paints the admixture of a little liquid siccatif causes very rapid drying. Trials have also been made to manufacture driers by the cold process, e.g., by mixing 10 parts of finely powdered lead acetate with 120 parts of poppy-seed oil, which mixture is exposed to sunlight in a glass vessel, shaking frequently. The colorless oil obtained, after admixture of 25 parts of oil of turpentine, dries quickly, forming a firm coating. If turpentine oil is simply agitated with powdered litharge and decanted, a constant liquid is obtained which gives a very resistive coating that will not crack off.

9.—**Cobalt and Manganese Benzoates.**—Benzoic acid is dissolved in boiling water, the liquid being continually stirred, and neutralized with cobalt carbonate until effervescence ceases. Excess of carbonate is removed by filtration, and the liquor is evaporated to dryness. The salt thus prepared is an amorphous, hard, brownish material, which may be powdered like rosin, and kept in the pulverulent state in any climate, simply folded in paper. Painting executed with a paint composed of 3 parts of this drier with 1,000 of oil and 1,200 of zinc white, dries in 18 to 20 hours. Manganese benzoate is prepared in the same way, substituting manganese carbonate for that of cobalt. Applied under similar circumstances, it dries a little more rapidly, and a little less is required. Urobenzoic (hippuric) acid is equally efficacious.

10.—**Linoleate of Barium.**—Raw linseed oil, 20 gal.; caustic soda, 24 lb. Process.—As for linoleate of manganese, precipitating with barium chloride solution.

11.—**Linoleate of Copper.**—Raw linseed oil, 20 gal.; caustic soda, 24 lb. Process.—As for linoleate of manganese, precipitating with sulphate of copper solution.

12.—**Linoleate of Lead.**—Raw linseed oil, 20 gal.; caustic soda, 24 lb. Process.—As for linoleate of manganese, using sugar of lead solution to precipitate.

13.—**Linoleate of Magnesium.**—Raw linseed oil, 20 gal.; caustic soda, 24 lb. Process.—As for linoleate of manganese, precipitating with sulphate of magnesia solution. Chloride of magnesia may be used, but the sulphate is recommended.

(Driers)

14.—*Linoleate of Manganese*.—a.—This is prepared by pouring a solution of soap, made by boiling linseed oil with caustic soda, into a solution of manganese sulphate or chloride. It forms a dark brown plaster-like mass, rather liable to oxidation; when exposed to the air the surface becomes covered with a hard and rather insoluble skin, which protects the under parts from further oxidation. It is important, therefore, to keep linoleate of manganese in tightly-closed vessels. It is, or should be, readily soluble in hot linseed oil and chloroform. It acts both as a bleaching agent and dyer on linseed oil. 1 lb. first mixed with 5 lb. of linseed oil, and then poured into 10 gal. of linseed oil at 250° F., gives a good drying oil.

b.—Raw Linseed Oil, 20 gal.; caustic soda, 24 lb. Process.—Saponify the oil with a lye made from the caustic soda, about 30° B. Dissolve the soap by addition of hot water and add chloride or sulphate of manganese till the liquor is exhausted of soap. Wash on cloth filter and melt with gentle heat, and run into kegs to stock for use.

15.—*Linoleate of Zinc*.—Raw linseed oil, 20 gal.; caustic soda, 24 lb. Process.—As for linoleate of manganese, precipitating with sulphate of zinc solution.

16.—*Litharge*.—a.—Litharge, 1½ lb.; whiting, 5 lb.; barytes, 3 lb.; sugar of lead, 1½ lb.; sulphate of zinc, 2¼ lb.; white lead, 1½ lb.; refined linseed oil, ½ gal.

b.—Without Litharge or Sugar of Lead. —(1) Barytes, 5 lb.; whiting, 5 lb.; dry white lead, 1 lb.; linseed oil, 1 qt. Well mix the dry ingredients, then grind with the oil. (2) Borate of manganese, ½ lb.; carbonate of zinc, 6 lb.; linseed oil, 6 lb. Mix the two dry ingredients, then grind in the oil.

17.—*Manganese Oxide*.—Purified linseed oil is boiled for 6 or 8 hours, and to every 100 lb. boiled oil are added 5 lb. of powdered manganese peroxide, which may be kept suspended in a bag, like litharge. The liquid is boiled and stirred for 5 or 6 hours more, and then cooled and filtered. This drying oil is employed in the proportion of 5 to 10% of the zinc white.

18.—*Patent Drier*.—Grind together ground litharge, ½ lb.; white sugar of lead, 1 lb.; barytes, 12 lb.; whiting, 2 lb.; dry white lead, ½ lb.; sulphate of zinc, 1 lb.; boiled linseed oil, 2½ lb.

19.—Rosin, 98 lb.; soda lye, 30° B., 12 gal. Process.—As for rosinate of man-

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gane, precipitating with barium chloride solution.

20.—*Rosinate of Copper*.—Pale rosin, 98 lb.; soda lye, 30° B., 12 gal. Process.—As for rosinate of manganese, precipitating with sulphate of copper solution.

21.—*Rosinate of Lead*.—a.—This is prepared by pouring a rosin soap solution, made as mentioned under Rosinate of Manganese, into a solution of lead acetate. It forms either a cream-colored powder or brownish lumps, according as it is dried at a low temperature or melted. It is easily soluble in hot linseed oil or chloroform. 3 lb. of the rosinate of lead dissolved in 10 gal. of hot linseed oil at 250° F. make a good drying oil; 6 lb. in the same quantity of oil give a quick drying oil.

b.—Rosin, 98 lb.; soda lye, 30° B., 12 gal. Process.—As for rosinate of manganese, using sugar of lead solution to precipitate.

22.—*Rosinate of Lead and Manganese* is a preparation formed by combining the two last-named bodies. It possesses intermediate properties.

23.—*Rosinate of Lime*.—Pale rosin, 112 lb.; quick lime, ¼ lb.; water, ad lib. Process.—Slake the lime in a steam-jacket pan, add the rosin, and boil the whole together till all water is evaporated. Fuse the rosinate of lime produced at a gentle heat. Heat the powder when required for use.

24.—*Rosinate of Magnesium*.—Rosin, 98 lb.; soda lye, 30° B., 12 gal. Process.—As for rosinate of manganese, precipitating with sulphate of magnesia solution. Chloride of magnesia may be used, but the sulphate is recommended.

25.—*Rosinate of Manganese*.—a.—This is prepared by pouring a solution of rosin soap, made by boiling rosin with caustic soda, into a solution of manganese sulphate, when it precipitates out. On filtering, washing and drying, it forms a flesh-colored powder, readily soluble in hot linseed oil or in chloroform. By heating it melts, and then it forms dark brown lumps, which are also fairly soluble in hot linseed oil or chloroform. By dissolving 2 lb. of this in 10 gal. of linseed oil at 250° F. a quick drying oil, leaving a glossy coat, is obtained.

b.—Rosin, 98 lb.; soda lye, 30° B., 12 gal. Common or pale rosin may be used according as pale or dark rosinate is desired. Process.—Make a soap of the rosin and lye by boiling together. Dissolve the soap in boiling water, and pour in a solution of chloride of manganese or sulphate of manganese till the rosin

## Paints, Varnishes, Etc.

### (Enamels)

is all precipitated. Wash the precipitate on a cloth filter, dry and stock for use.

26.—*Rosinate of Zinc*.—Rosin, 98 lb.; soda lye, 30° B., 12 gal. Process.—As for rosinate of manganese, precipitating with sulphate of zinc solution.

27.—*Zinc Drier*.—Dry manganese sulphate, 6½ lb.; Dry manganese acetate, 6½ lb.; dry zinc sulphate, 6½ lb., and zinc white, 980 lb., are ground together. From 2 to 3% of this is usually added to the paint. This is called zinc drier, because it was brought out as a drier for zinc white. It is also known as Guynemer's drier.

28.—*Zumatie Drier*.—25 lb. of zinc white and 1 lb. of borate of manganese are ground together. The object of the zinc white is simply to dilute the manganese salt, and to form a powerful drier in a convenient form. The proportions generally used are 1 lb. of the drier to 25 lb. of paint.

### ENAMELS

#### Baths, etc., Transparent Enamel for.

Pale manilla gum (clear as possible), 30 lb.; melt by heat (great heat is required for this). Add, while on the fire, 2 gal. hot Baltic linseed oil at 400° F., and work well in, then add 1 gal. more linseed oil. Take off the fire and beat the heat out until clear; cool down, and add 7 gal. turps. Take 8 lb. best zinc white ground in crystal paper varnish to each gallon of the above. (For crystal varnish, 4 lb. dammar dissolved in 1 gal. turps cold.)

#### Brick Walls.

1.—Water white rosin, 112 lb.; sweat 4 hours at 240° F., cool to 150° F., and add: Zinc white, 168 lb.; mineral naphtha, 16 gal.; benzoline, 8 gal. Add ½ pt. hard oak varnish to each gallon of the above.

2.—*Red Enamel*.—W. W. rosin, 112 lb.; turkey red, 112 lb.; whiting, 56 lb.; mineral naphtha, 16 gal.; benzine, 8 gal. Process as above.

#### Colors.

The copal varnish being the same in every case, the following indicate how various shades may be obtained:

1.—*Black*.—a.—Lampblack, 56 lb.; carbon black, 2 lb.

b.—Lampblack, 28 lb.; mineral black, 28 lb.; carbon black, 2 lb.

2.—*Blue*.—a.—Royal Blue.—Ultramarine blue, 28 lb.; whiting, 14 lb.; China clay, 14 lb.

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b.—Skyblue.—No. 1.—Zinc white, 56 lb.; Chinese blue, 1 lb.

3.—*Cerise*.—Middle royal red, 70 lb.; zinc white, 21 lb.

4.—*Chocolate*.—Middle Indian red, 56 lb.; lampblack, 3 lb.

5.—*Crimson*.—Crimson lake, 28 lb.; vermilionette, 14 lb.; Indian red, 14 lb.

6.—*Fawn*.—Zinc white, 56 lb.; middle Indian red, 1 lb.; English ocher, 4 lb.; English umber, 4 lb.; vermilionette, 1 lb.

7.—*Green*.—a.—Apple Green.—Middle Brunswick green, 28 lb.; No. 2 lemon chrome, 28 lb.

b.—Dark Green.—Use dark Brunswick green.

c.—Early Green.—Zinc white, 28 lb.; deep emerald tint Brunswick green, 28 lb.

d.—Light Green.—Use light Brunswick green.

e.—Middle Green.—Use middle Brunswick green.

f.—Olive green.—Middle Brunswick green, 56 lb.; lampblack, 1 lb.

g.—Sea green.—Zinc white, 56 lb.; Chinese blue, 1 lb.; No. 1 lemon chrome, 3 lb.

8.—*Gray, French*.—Zinc white, 56 lb.; lampblack, 1 lb.; Venetian red, ½ lb.

9.—*Lemon Chrome*.—Use No. 1 lemon chrome.

10.—*Mahogany*.—Middle Indian red, 42 lb.; French ocher, 21 lb.

11.—*Maroon*.—Middle Indian red, 28 lb.; burnt Turkey umber, 28 lb.

12.—*Primrose*.—Zinc white, 28 lb.; No. 1 lemon chrome, 28 lb.

13.—*Red*.—a.—Dark Red.—Middle royal red, 28 lb.; middle Indian red, 28 lb.

b.—Post Office Red.—Use middle royal red, or try middle royal red, 56 lb.; whiting, 14 lb.; China clay, 14 lb.

c.—Signal Red.—1.—Middle royal red, 42 lb.; bright red oxide, 14 lb. 2.—Middle royal red, 42 lb.; bright red oxide, 14 lb.; whiting, 7 lb.; China clay, 7 lb.

14.—*Rose Tint*.—Zinc white 56 lb.; middle royal red, 2 lb.

15.—*Salmon Pink*.—Zinc white, 56 lb.; middle royal red, 3 lb.; No. 1 lemon chrome.

16.—*Terra Cotta*.—Middle Indian red, 56 lb.; English ocher, 56 lb.; English umber, 2 lb.

17.—*Vermilion Tint*.—Vermilionette, 56 lb.; No. 1 lemon chrome, 4 lb.

18.—*White*.—a.—Zinc white 56 lb.; ultramarine blue, 1 oz.

b.—Best Quality.—For the Varnish: Gum dammar, 56 lb.; turps, 8 gal. Churn together cold and let stand to clear. Take: Pure zinc white, 6 lb.; var.

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### (Enamels)

nish as above, 1 gal. Grind together and thin to consistency with varnish as above.

c.—**Cheapest White Enamels.**—1.—W. W. rosin, 56 lb.; raw linseed oil,  $\frac{1}{4}$  gal. Sweat for about 4 hours, cool to about 150° F., and thin with: Benzine, 2 gal.; shale spirit, 1 gal.

d.—Zinc oxide, 7 lb.; ultramarine blue,  $\frac{1}{4}$  oz.; varnish (copal),  $1\frac{1}{2}$  gal.; dammar varnish, 1 gal.; French oil varnish,  $\frac{1}{2}$  gal.

10.—**Yellow.**—Pure Naples yellow, 112 lb.; copal varnish, 5 gal.; special oil, 5 gal.; turpentine,  $1\frac{1}{2}$  gal. The special oil referred to above should either be carefully refined and racked linseed oil or pale boiled oil containing a minimum of sugar of lead or borate of manganese drier.

#### **Copal Varnish, Enamels Made with.**

1.—The copal varnish used must be a genuine copal, warranted free from rosin and soft gums, which will not stand great heat, but soften, thereby gathering dust, and so being spoiled.

2.—**Gray.**—Gray zinc oxide, 112 lb.; copal varnish, 6 gal.; special oil, 6 gal.; turpentine,  $1\frac{1}{2}$  gal.

3.—**White.**—Zinc white, 112 lb.; copal varnish,  $1\frac{1}{2}$  gal.; special oil, 12 gal.; turpentine,  $1\frac{1}{2}$  gal.

#### **Machinery.**

1.—**Azure Blue Enamel.**—Zinc oxide,  $3\frac{1}{2}$  oz.; ultramarine blue,  $1\frac{1}{2}$  oz.; Prussian blue, a little; boiled oil and varnish, 1 pt.

2.—**Gray Coach Color.**—Zinc oxide, 30 lb.; vegetable black,  $\frac{1}{2}$  lb.; Prussian blue,  $\frac{1}{2}$  lb.; thinnings (as above), 4 gal.

3.—**Special Vermilion.**—Vermilionette, 6 oz.; best Venetian red,  $\frac{1}{4}$  oz.; lemon chrome,  $\frac{1}{4}$  oz.; zinc oxide, 1 oz.; boiled oil varnish, 1 qt.

4.—**White Enamel.**—Zinc white, 14 lb.; ultramarine blue,  $\frac{1}{2}$  oz.; raw oil,  $1\frac{1}{2}$  pt.; dammar varnish,  $2\frac{3}{4}$  gal.

#### **Safes.**

1.—**Light Chocolate.**—White lead, 40 lb.; zinc oxide, 70 lb.; raw sienna, 20 lb.; lemon chrome,  $7\frac{1}{2}$  lb.; Venetian red,  $1\frac{3}{4}$  oz.; ultramarine blue,  $1\frac{3}{4}$  oz.; oak varnish, 16 gal.; raw oil, 2 gal.; slow-drying.

2.—**Wine Color.**—Rose pink,  $3\frac{1}{2}$  lb.; vermilionette,  $1\frac{1}{2}$  lb.; gold size and turps, each  $\frac{1}{2}$  pt.

3.—**Dark Brunswick Green (Dead Surface).**—Dark Brunswick green, 5 lb.; China clay, 1 lb.; dark terebinte, 6 pt.; gold size, 2 pt.

### (Fillers)

#### **Silicate Enamel.**

To any quantity of pure dry zinc white or good quality pulp color add sufficient silicate of soda diluted with water to render it of a consistency capable of being easily worked with a brush. One coat will show well, but if a second is applied after the first is thoroughly dry, the result will be much superior. If it be used on articles the size of which will allow of their being stoved at a temperature of 175° F., a surface like porcelain will be the result. It will be found to equal any enamel of the kind in present use.

#### **Transparent Enamel Varnish.**

Very pale manilla gum, 20 lb., must be run as clear as possible (great heat is required for this); then add, while on the fire, 2 gal. of Baltic linseed oil at 400° F., and work well in; then add 1 gal. more of linseed oil. Take off the fire, and beat the heat out until clear, cool to 250° F., and add 7 gal. turps.

#### **Wood, Black Enamel for.**

Prime the wood with linseed oil, turpentine and white lead; then give it 2 or 3 coats of black, mixed with copal varnish and turpentine. Rub it down, when dry, with pumice stone and water; finally varnish with copal; again rub down, and polish with oil and rotten stone to obtain a perfect smoothness.

### FILLERS FOR WOOD

1.—Take equal parts of japan, boiled linseed oil and turpentine, and half that quantity of starch. Mix thoroughly, and apply with a sponge or flannel. When the polish is for walnut, a little burnt umber is added to the solution, and a little Venetian red when for cherry wood.

2.—**American Wood Filler.**—Apply to the wood with a brush the following mixture: Pulverized starch, by weight, 3 parts; heavy spar, 3 parts;  $\frac{1}{2}$  by weight of siccativ, with enough turpentine to make of the consistency of ordinary varnish. For dark woods add to the siccativ, umber up to  $\frac{1}{2}$  part. Rub across the grain of the wood with a piece of felt fastened to a piece of wood. Let the wood dry about 8 hours, rub with glass paper, then polish and varnish.

3.—**Filling for Cracks.**—A very complete filling for open cracks in floors may be made by thoroughly soaking newspapers in paste made of 1 lb. of flour, 3 qt. of water and 1 tablespoonful of alum, thoroughly boiled and mixed. Make the

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### (Japans)

final mixture about as thick as putty, and it will harden like papier mâché. This paper may be used for molds for various purposes.

4.—*German Wood Filling*.—Fill the pores of the wood with new tallow and plaster of paris, well amalgamated before a fire, if the weather is cold. Darken, if required, with any coloring to suit. When well rubbed in, give a coat of shellac and French polish or varnish.

5.—*Hard Wood Filler*.—a.—Use boiled oil and enough corn starch to make a very thick paste; add a little japan, and reduce with turpentine; add no color for white oak; for dark ash and chestnut, use a little raw sienna; for walnut, burnt umber and a very little Venetian red; for bay wood, burnt sienna. Use enough color to cover the white of the starch. Apply with brush and rags. Let it dry 48 hours, or until it is in condition to rub down with No. 0 sandpaper, without much gumming up, and if an extra fine finish is desired, fill again with the same materials, using less oil but more of japan and turpentine. The second coat will not shrink, it being supported by the first coat. When the second coat is hard the wood is ready for finishing up in any desired style or to any degree of nicety by following up the usual methods. This formula is not intended for rosewood, and will not be satisfactory if used therefor.

b.—Boiled linseed oil, 1 qt.; turpentine, 3 qt.; corn starch, 5 lb.; japan, 1 qt.; calcined magnesia, 2 oz.; mix thoroughly.

c.—Whitening, 6 oz.; japan,  $\frac{1}{2}$  pt.; boiled linseed oil,  $\frac{1}{2}$  pt.; turpentine,  $\frac{1}{2}$  pt.; corn starch, 1 oz. Mix well together and apply to the wood. Add coloring if required.

### JAPANS AND JAPANING

When finished, wood, papier mâché, composition or materials are varnished in the usual manner and left to dry in the air; the drying is, in most cases, imperfect, and the coating more or less uneven. If the surface thus varnished is heated for some time to a temperature of from 250° to 300° F., or higher, it is found that the whole of the solvent or vehicle of the gums or rosins in the varnish is soon driven off, and the gummy residue becomes liquefied or semi-liquefied, in which state it adapts itself to all inequalities, and, if the coating is thick enough, presents a uniform glossy surface, which it retains on cooling. This process of drying out and fusion secures a firm contact and adhesion of the gums or rosins to the surface of the substance

### (Japans)

varnished, and greatly increases the density of the coating, which enables it to resist wear and retain its gloss longer. This process of hardening and finishing varnished or lacquered work by the aid of heat constitutes the chief feature of the japanner's art. In practice, the work to be japanned is first thoroughly cleansed and dried. If of wood, composition, or other porous material, it is given, while warm, several coats of wood filler, or whitening mixed up with a rather thin glue size, and is, when this is hardened, rubbed down smooth with pumice stone. It is then ready for the japan grounds. Metals, as a rule, require no special preparation, receiving the grounds directly on the clean, dry surface. In japanning, wood and similar substances require a much lower degree of heat, and usually a longer exposure in the oven than metals, and again a higher temperature may be advantageously employed when the japan is dark than when light-colored grounds are used; so that a definite knowledge of just how much heat can be safely applied, and how long an exposure is required with different substances and different grounds can only be acquired by practical experience. Large japanners seldom make their own varnishes, as they can procure them more cheaply from the varnish maker. The japanner's oven is usually a room, or large box, constructed of sheet metal, and heated by stove drums or flues, so that the temperature—which is indicated by a thermometer or pyrometer hung up inside, or with its stem passing through the side wall midway between the top and bottom of the chamber—can be readily regulated by dampers. The ovens are also provided with a chimney to carry off the vapors derived from the drying varnish, a small door through which the work can be entered and removed, and wire shelves and hooks for its support in the chamber. The ovens must be kept perfectly free from dust, smoke and moisture. A good cheap priming varnish for work to be japanned consists of pale shellac, 2 oz.; pale rosin, 2 oz.; rectified spirit, 1 pt. Two or three coats of this are put on the work in a warm, dry room. A good background is prepared by grinding fine ivory black with a sufficient quantity of alcoholic shellac varnish on a stone slab with a muller until a perfectly smooth black varnish is obtained. If other colors are required, the clear varnish is mixed and ground with the proper quantity of suitable pigments, in a similar manner; for red, vermilion or Indian red; green, chrome green or



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### (Japans)

Prussian blue and chrome yellow; blue, Prussian blue, ultramarine or indigo; yellow, chrome yellow, etc. But black is the hue commonly required.

*Application.*—From 1 to 6 or more coats of varnish are applied to work in japanning, each coat being hardened in the oven before the next is put on. The last coat in colored work is usually of clear varnish, without coloring matters, and is, in fine work, sometimes finished with rotten stone and chamois. For ordinary work, the gloss developed in the oven, under favorable conditions, is sufficient.

*Black.*—1.—Asphaltum, 3 oz.; boiled oil, 4 qt.; burnt umber, 8 oz. Mix by heat, and, when cooling, thin with turpentine.

2.—Amber, 12 oz.; asphaltum, 2 oz.; fuse by heat, and add boiled oil,  $\frac{1}{2}$  pt.; rosin, 2 oz.; when cooling, add 16 oz. of oil of turpentine. Both are used to varnish metals.

3.—Mix shellac varnish with either ivory black or lampblack, but the former is preferable. These may be always laid on with the shellac varnish, and have their upper or polishing coats of common seed lac varnish.

4.—A common black japan may be made by painting a piece of work with drying oil and putting the work into a stove, not too hot, but of such a degree as will change the oil black without burning it, gradually raising the heat and keeping it up a long time. This requires no polishing.

5.—Asphaltum,  $\frac{1}{2}$  lb.; melt; then add hot balsam of capivi, 1 lb.; and when mixed, thin with hot oil of turpentine.

6.—Grind lampblack very smooth on a marble slab, with a muller, with turpentine, and then add copal varnish to the proper consistency.

7.—For Leather.—Burnt umber, 4 oz.; true asphaltum, 2 oz.; boiled oil, 2 qt. Dissolve the asphaltum by heat in a little of the oil, add the burnt umber, ground in oil, and the remainder of the oil; mix, cool, and thin with turpentine. Flexible.

*Blue Grounds.*—Blue japan grounds may be formed of bright Prussian blue. The color may be mixed with shellac varnish, and brought to a polishing state by 5 or 6 coats of seed lac varnish. The varnish, however, is apt to give a greenish tint to the blue, as the varnish has a yellowish tinge, and blue and yellow form a green. Whenever a light blue is desired, the purest varnish must always be used.

### (Japans)

*Carriage Japan.*—Raw linseed oil, 40 gal.; litharge, 40 lb.; red lead, 20 lb.; black oxide of manganese, 10 lb.; white gum shellac, 2 lb. Set the oil over the fire, and bring to the boiling point; add, by degrees, litharge and red lead, alternately and slowly; add the gum, and when this is melted put in the manganese, and keep the whole in rapid motion from the time the oil is 200° F. until the making is finished. When the mixture is cool enough to bear the finger in a moment, add from 20 to 30 gal. of spirits of turpentine.

*Green Grounds.*—A good green may be made by mixing Prussian blue along with the chromate of lead, or with turmeric, or orpiment (sulphuret of arsenic), or ochre, only the two should be ground together and dissolved in alcohol, and applied as a ground, then coated with 4 or 5 coats of shellac varnish in the manner already described. A very bright green is made by laying on a ground of Dutch metal or leaf of gold, and then coating it over with distilled verdigris dissolved in alcohol, then the varnishes on the top. This is a splendid green, brilliant and glowing.

*Imitation of Japanning.*—The peculiar glossy surface on the so-called japan trays can only be given by practice, but a near imitation may be effected as follows: Mix ivory black with melted size, apply the mixture quite hot to the box, or any other wooden article that it may be desired to treat in this manner; when dry, sandpaper the box, then give another coat of black; when this second coat is dry, bring to smoothness with sandpaper, at the same time taking care not to remove the stain, so that the light wood below is exposed. Now procure 1 lb. of black japan and 1 gill of turpentine; mix enough of the black japan for present use, with turpentine, of which only sufficient should be used to make the japan fluid enough to run from the brush. A fine-haired paint brush should be employed. If properly done, one coat will be sufficient. The box will look nearly equal to the japan goods. Dry the varnished box in a warm room free from dust.

*Orange-Colored Grounds.*—These may be made of yellow mixed with vermilion or carmine, just as a bright or rather inferior color is wanted. The yellow should always be in quantity to make a good full color, and the red added in proportion to the depth of shade. If there is not a full good body of yellow the color will look watery or bare, as it is technically termed.

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**Purple Grounds.**—These are made by a mixture of lake and Prussian blue or carmine, or for an inferior color vermilion, and treated as the foregoing. When the ground is laid on and perfectly dried, a fine coat of pure boiled nut oil, then laid on and perfectly dried, is a good method to have a japan not liable to crack. But a better plan is to use this oil in the varnish given the first coat, after the ground is laid on, and which should contain considerable of pure turpentine. In every case where oil is used for any purpose for varnish, it is all the better if turpentine is mixed with it. Turpentine enables oils to mix with either alcohol or water. Alkalies have this property also.

**Red Japan Ground.**—The base of this japan ground must be made up with madder lake, ground with oil of turpentine; this forms the first ground; when perfectly dry a second coat must be applied, composed of lake and white copal varnish; and the last with a coat composed of a mixture of copal and turpentine varnish mixed up with lake. Vermilion or carmine can also be used for red japan instead of lake.

**Ten Trays.**—First clean them thoroughly with soap and water and a little rotten stone; then dry them by wiping and exposure at the fire. Now get some good copal varnish, mix it with some bronze powder, and apply with a brush to the denuded parts, after which set the tea tray in an oven at a heat of from 212 to 300° F., until the varnish is dry. Two coats will make it equal to new.

**Tin, Japan Flow for.** 1.—Spirits of turpentine, 3 qt.; balsam of tolu, 3 oz.; linseed oil,  $\frac{3}{4}$  pt.; acetate of lead, 3 oz.; balsam of fir, 3 oz.; gum sandarac,  $1\frac{1}{2}$  lb. Put all these materials, except the turpentine, in a suitable vessel, place over a slow fire at first, then increase the heat until they are melted. When a little cool stir in the turpentine, and strain. This japan is transparent, but may be colored if desired.

2.—Melt 50 lb. of Naples asphaltum and 8 lb. of dark gum anime; boil for about 2 hours in 12 gal. of linseed oil; then melt 12 lb. of dark gum amber, and boil it with 2 gal. of linseed oil; add this to the other and add driers. Boil for about 2 hours, or until the mass, when cooled, may be rolled into little pellets. Withdraw the heat, and thin down with 30 gal. of turpentine. During the boiling the mass must be constantly stirred to prevent boiling over.

3.—**Tin Lantern.**—The following are

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the proportions for black japan: Asphaltum,  $1\frac{1}{2}$  oz.; boiled linseed oil, 4 pt.; burnt umber, 4 oz. Heat till well mixed, and when cool add turpentine till of a proper consistency.

4.—**Transparent.**—Oil of turpentine, 8 oz.; oil of lavender, 6 oz.; camphor, 1 dr.; bruised copal, 2 oz. Dissolve. Used for japanning tin. Quick-drying copal varnish is usually substituted.

**Tortoiseshell Japan.** Tortoiseshell japan is extremely pretty, and comparatively easy to manipulate. The work is first coated with a japan made by boiling 2 pt. of linseed oil, to which  $\frac{1}{4}$  lb. of umber has been added, till it becomes thickened; the mixture is then strained, and further boiled until it becomes of a pitchy consistency. This is mixed with turpentine to a workable consistency, and then applied. On a thoroughly dry coating of this japan lay a quantity of vermilion spots to represent the clear portions of the shell. The vermilion japan is made by adding vermilion to shellac varnish; it should be laid on thinly, and dried. The whole surface is then finally coated with a thin layer of the above described brown japan, still further diluted with turpentine. A long course of stoving will be necessary to thoroughly harden the japanning.

**White.**—A white ground is prepared from copal varnish and zinc white or starch.

**Yellow Japan Grounds.** 1.—King's yellow may be used, and the effect will be heightened by dissolving powdered turmeric root in the spirits of wine, of which the upper or polishing coat is made, which spirits of wine must be strained from off the dregs before the seed lac is added to it to form the varnish.

2.—If turmeric be dissolved in the spirits of wine and strained through a cloth, and then mixed with pure seed lac varnish, it makes a good yellow japan. Saffron will answer for the same purpose in the same way, but the brightest yellow ground is made by a primary coat of pure chrome yellow, and coated successively with the varnish.

### LACQUERS AND LACQUERING

Lac and the Art of Lacquering are treated of in our Scientific American Supplement Numbers 1377, 1415, 1426 and 1797.

**Materials for Lacquering.**—The lacquer = shellac + alcohol. Other substances: A, spirits of turpentine, turpentine varnish, mastic varnish, Canada balsam; B, pyroacetic ether; C = red, dragon's

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blood, annatto, red sanders; D = yellow, turmeric, gamboge, saffron, sandarac, cape aloes.

**Directions for Making.**—Mix the ingredients, and let the vessel containing them stand in the sun, or in a place slightly warmed, 3 or 4 days, shaking it frequently till the gum is dissolved, after which let it settle from 24 to 48 hours, when the clear liquid may be poured off for use. Pulverized glass is sometimes

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brush should have the ends of the hairs all exactly even. If not so, trim the ends with sharp scissors.

5. Scrape the brush as dry as possible on the wire, making a flat, smooth point at the same time.

6. Use the very tip of the brush to lacquer with, and carry a steady hand.

7. Put on at least 2 coats. It is well (to make a very durable coat) to blaze off after each coat with a spirit lamp or

TABLE OF LACQUERS.

SOLUTIONS.										REDS.					YELLOWs.																
Shellac.		Mastic.		Canada Balsam.		Alcohol.		Pyro-acetic Ether.		Spirits of Turpentine.		Turpentine Varnish.		Simple Pale Lacquer.		Dragon's Blood.		Annatto.		Sanders.		Turmeric.		Gamboge.		Saffron.		Cape Aloes.		Sandarac.	
No.	oz.	dr.	dr.	pt.	oz.	dr.	oz.	pt.	dr.	dr.	gr.	dr.	dr.	dr.	dr.	dr.	dr.	dr.	dr.	dr.	dr.	dr.	dr.	dr.	dr.	dr.	dr.	dr.	dr.	dr.	
1	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
6	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
8	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
10	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
11	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
13	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
14	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
15	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
16	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
18	15	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	
19	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

The union of red with yellow produces a fine orange color. dr. = drachm; gr. = grain.

used in making lacquer, to carry down the impurities.

## Brass.

1.—Be sure there is no oil or grease on the brass; do not touch the work with the fingers; hold it with spring tongs or a taper stick in some of the holes.

2.—Always handle with a piece of clean cloth.

3.—Heat the work so hot that the brush will smoke when applied, but avoid overheating, as it burns the lacquer.

4.—It is well to fasten a small wire across the lacquer cup, from side to side, to scrape any superfluous lacquer. The

Bunsen burner, taking care not to overheat and burn the lacquer.

8.—If the lacquer is too thick it will look gummy on the work. If too thin, it will show prismatic colors. In the first case add a little alcohol; in the latter, set the cup on the stove and evaporate some.

9.—A good deal of cheap work, like lamp burners, is dipped. Use a bath of nitric and sulphuric acids, equal parts; dip work, hung on wire, into acid for a moment; remove, rinse in cold water thoroughly; dip in hot water, remove, put in alcohol, rinse around, then dip momentarily in a lacquer, shaking vigorously on removing, to throw off extra lacquer,

## Paints, Varnishes, Etc.

### (Lacquers)

and lay on a warm metal plate till dry; let cool, and it is done.

10.—Avoid handling lacquered work until cold.

*Lacquers for Brass.*—1.—Seed lac, dragon's blood, annatto and gamboge, of each 4 oz.; saffron, 1 oz.; alcohol, 10 pt.  
2.—Turmeric, 1 lb.; annatto, 2 oz.; shellac and gum juniper, each 12 oz.; alcohol, 12 oz.

3.—Seed lac, 6 oz.; dragon's blood, 40 gr.; amber and copal, triturated in a mortar, 2 oz.; extract of red sanders,  $\frac{1}{2}$  dr.; Oriental saffron, 36 gr.; coarsely powdered glass, 4 oz.; absolute alcohol, 40 oz. Very fine.

4.—Seed lac, 3 oz.; amber and gamboge, each 2 oz.; extract of red sanders,  $\frac{1}{2}$  dr.; dragon's blood, 1 dr.; saffron,  $\frac{1}{2}$  dr.; alcohol, 2 pt. 4 oz.

5.—Turmeric, 6 dr.; saffron, 15 gr.; hot alcohol, 1 pt.; draw the tincture, and add gamboge, 6 dr.; gum sandarac and gum elemi, each 2 oz.; dragon's blood and seed lac, each 1 oz.

6.—Alcohol, 1 pt.; turmeric, 1 oz.; annatto and saffron, each 2 dr. Agitate frequently for a week, filter into a clean bottle, and add seed lac, 3 oz. Let stand, with occasional agitation, for about 2 weeks.

7.—Gamboge,  $\frac{1}{2}$  oz.; aloes,  $1\frac{1}{2}$  oz.; fine shellac, 8 oz.; alcohol, 1 gal.

8.—Put 3 oz. of seed lac, 2 dr. of dragon's blood and 1 oz. of turmeric powder into 1 pt. of alcohol. Let the whole remain for 14 days, but during that time agitate the bottle once a day at least. When properly combined, strain the liquid through muslin, when it is ready for use.

9.—To 5 oz. of alcohol add gamboge enough to give a bright yellow color, and 3 oz. of seed lac in fine powder. Put in a sand bath till dissolved.

10.—Ground turmeric, as sold, 1 oz.; saffron and Spanish annatto, each 2 dr.; highly rectified alcohol, 1 pt. Place them in a moderate heat, shaking occasionally, for several days; then add 3 oz. of good seed lac, roughly powdered; shake occasionally until the lac is dissolved. If a deep orange lacquer is required, increase the quantity of annatto; if a bright yellow, decrease it. Lay it on with a brush (warm), like you would paint. One or more coats, if necessary. Avoid using too much seed lac, as it has a tendency to prevent the lacquer lying evenly.

11.—Pale gold lacquer is best for microscope; be sure and get the best quality, and see that the things are sufficiently hot before putting on the lacquer; heat

### (Lacquers)

after lacquering, and it will stand well. Damp will affect the best lacquering.

12.—No. 3 is the best for optical work. If it comes off, either the metal was not clean, when applied, or else it was put on cold. The metal should be heated to just such a point that it dries as fast as the brush passes over it. Work is often spoiled in lacquering. Circular things may be done in the lathe, going quite slow, and working a good body by going around several times.

13.—Bronzed Brass. To 1 pt. of the above lacquer add gamboge, 1 oz.; and after mixing it add an equal quantity of the first lacquer.

14.—Dipped Brass.—Alcohol, proof specific gravity not less than 95-100, 2 gal.; seed lac, 1 lb.; gum copal, 1 oz.; English saffron, 1 oz.; annatto, 1 oz.

15.—Gold-Colored Lacquer for Dipped Brass.—Alcohol, 36 oz.; seed lac, 6 oz.; amber, 2 oz.; gum gutta, 2 oz.; red sandalwood, 24 gr.; dragon's blood, 60 gr.; Oriental saffron, 36 gr.; pulverized glass, 4 oz.

16.—Gold-Colored Lacquer for Brass Not Dipped. Alcohol, 4 gal.; turmeric, 3 lb.; gamboge, 3 oz.; gum sandarac, 7 lb.; shellac,  $1\frac{1}{2}$  lb.; turpentine varnish, 1 pt.

17.—Gold-Colored Lacquer for Brass Watch Cases, etc.—Seed lac, 6 oz.; amber, 2 oz.; gamboge, 2 oz.; extract of red sanders wood in water, 24 gr.; dragon's blood, 60 gr.; oriental saffron, 36 gr.; powdered glass, 4 oz.; pure alcohol, 36 oz. The seed lac, amber, gamboge and dragon's blood must be pounded very fine on porphyry or clean marble, and mixed with the pounded glass. Over this mixture is poured the tincture formed by infusing the saffron and the sanders wood extract in the alcohol for 24 hours, then straining. Metallic articles that are to be covered with this varnish are heated, and, if they admit of it, immersed in packets.

18.—For philosophical instruments: Gamboge,  $1\frac{1}{2}$  oz.; sandarac, 4 oz.; elemi, 4 oz.; best dragon's blood, 2 oz.; terra merita (terra merita is the root of an Indian plant; it is of a red color, and much used in dyeing; in varnishing, it is only employed in the form of a tincture, and is particularly well adapted for the mixture of those coloring parts which contribute the most toward giving metals the color of gold; in choosing it, be careful to observe that it is sound and compact),  $1\frac{1}{2}$  oz.; oriental saffron, 4 gr.; seed lac, 2 oz.; pounded glass, 6 oz.; pure alcohol, 40 oz. The dragon's blood, gum

## Paints, Varnishes, Etc.

### (Lacquers)

elemi, seed lac and gamboge are all pounded and mixed with the glass. Over them is poured the tincture obtained by infusing the saffron and terra merita in the alcohol for 24 hours. This tincture, before being poured over the dragon's blood, etc., should be strained through a piece of clean linen cloth and strongly squeezed. If the dragon's blood gives too high a color the quantity may be lessened, according to circumstances. The same is the case with the other coloring matters. This lacquer has a very good effect when applied to many cast or molded articles used in ornamenting furniture.

**Bronze Lacquers.** 1.—To make a bronze lacquer, dissolve  $\frac{3}{4}$  lb. of shellac and  $\frac{1}{2}$  lb. of sandarac in 3 qt. of alcohol, and add enough extract of dragon's blood and turmeric to produce the desired color.

2.—For ornaments bronzed with gold-colored bronze, paint the articles, of cast iron, with white paint, which is white lead and oil; when hard dry, varnish with copal varnish; when sticky dry, dust the bronze powder over it; and when hard dry, brush off all the superfluous bronze with a camel's-hair brush. To protect it from the dust and from soiling, coat the bronze surface, when thoroughly dry, with spirit copal varnish.

**Color for Lacquer.**—Alcohol, 1 pt.; annatto, 2 oz.

**Colorless Lacquer.**—1.—For a colorless lacquer, dissolve bleached shellac in pure alcohol, settle, and decant. Make the lacquer very thin. The usual lacquer for brass is made with ordinary shellac and alcohol, made very thin, settled, and decanted.

2.—Mastic, 5 parts; amber, 5 parts; sandarac, 10 parts; shellac, 10 parts; alcohol, 100 parts.

**Combmakers' Lacquer.**—Elemi and mastic, each 1 part; shellac, 5 parts; strong alcohol, 20 parts.

**Copper.**—Mastic, 8 parts; camphor, 6 parts; sandarac, 15 parts; bleached shellac, 15 parts; alcohol, 40 parts.

**Green Lacquer.** 1.—Turmeric, 18 oz.; shellac, 15 oz.; gum sandarac, 1 oz.; gum elemi, 3 oz.; gamboge, 3 oz.; methylated spirits, 3 gal.; expose to a gentle heat; after straining, add  $1\frac{1}{2}$  gal. of spirit to the sediment, and treat as before.

2.—Mix 5 oz. of shellac, 6 oz. of turmeric, 4 oz. of gum sandarac and 1 oz. each of gum elemi and gum gamboge in 1 gal. methylated spirits; expose to gentle heat, strain, add  $\frac{1}{2}$  gal. of spirit to the sediment, and treat as before.

3.—Transparent Varnish.—Grind a

### (Lacquers)

small quantity of Chinese blue with double the quantity of finely powdered chromate of potash (it requires most elaborate grinding); add a sufficient quantity of copal varnish thinned with turpentine. The tone may be altered by more or less of one or the other ingredients.

**High-colored Lacquer.**—Spirits of wine, 2 qt.; shellac,  $2\frac{1}{2}$  oz.; gum sandarac, 2 oz.; gum elemi,  $\frac{1}{2}$  oz.; mix and keep gently warmed for 2 or 3 days; strain, color with dragon's blood to taste, and thin with 1 qt. of 90% alcohol.

**Iron, Lacquer for.**—1.—Asphaltum, 10 parts; rosin, 3 parts; lampblack, 1 part; petroleum, 25 parts.

2.—Amber, 12 parts; turpentine, 12 parts; rosin, 2 parts; asphaltum, 2 parts; drying oil, 6 parts.

3.—Asphaltum, 3 lb.; shellac,  $\frac{1}{2}$  lb.; turpentine, 1 gal.

**Jewelry Lacquer.**—Seed lac, 90 parts; gamboge gum, 30 parts; amber, 30 parts; dragon's blood, 2 parts; saffron, 1 part; sandal wood oil, 2 parts; alcohol (95%), 600 parts. The rosins are rendered soluble in the usual manner, and the ordinary method for the preparation of varnishes is followed.

**Linseed Oil and Caoutchouc Lacquer.**—6 lb. of caoutchouc is swelled in 3 lb. ether and rendered fluid by heating; 3 lb. linseed oil and 3 lb. oil of turpentine are then added; these oils must be warm when added.

**Matt Lacquer.**—This is sometimes called mattolein. Dissolve 30 parts of sandarac and 7 parts of mastic in 320 parts of ether, and add 100 to 200 parts benzine. The more added the coarser will be the grain.

**Sheet Metal, Lacquer for.**—Asphaltum, 5 parts; colophony, 3 parts; oil of turpentine varnish (see VARNISHES), 10 parts; oil of turpentine, 14 parts.

**Silvered Articles, To Lacquer.**—The parts previously protected by a coating of whites of eggs, and the lacquer applied as usual when the sizing of eggs is dry.

**Steel, Lacquer for.**—Pure mastic, 8 parts; camphor, 4 parts; sandarac, 12 parts; elemi, 4 parts. Dissolve in pure alcohol; filter. Use the lacquer cold. It will be clear and transparent when dry.

**Tin Plate, Lacquer for.**—1.—Alcohol, 12 oz.; turmeric, 6 dr.; saffron, 3 scruples; sandarac, 3 dr.; Canada balsam, 3 dr.; mastic, 3 dr. When dissolved, add oil of turpentine, 120 minims.

2.—Alcohol, 1 qt.; shellac, 4 oz.; red sanders, 1 oz.; turmeric, 2 oz. Shake frequently for 24 hours, and bottle. Various

## Paints, Varnishes, Etc.

### (Paints)

colors can be given to the lacquer by adding Prussian blue, lakes, etc.

3.—Use as a body shellac or gum sandarac varnish. To make it adhere, add to it  $\frac{1}{2}$  part boracic acid to 1,000 parts lacquer. Color with suitable pigments, such as gamboge, Prussian blue or carmine. Aniline colors may be used, but tend to fade. Excellent results may be attained by adding a little castor oil, which makes the lacquer much tougher.

4.—Gold Lacquer.—Clean the tin plate carefully and apply the following mixture: Dark copal lacquer, 3 parts; linseed oil,  $1\frac{1}{2}$  parts. Dry the plates. The lacquer will not crack or lose its luster if the tin plates are bent or hammered.

*Tinfol. Lacquer for.*—Alcohol,  $1\frac{1}{2}$  qt.; shellac,  $10\frac{1}{2}$  oz. Dissolve the shellac in the alcohol and filter. Prevent the evaporation of the alcohol as much as possible. Add to this shellac varnish,  $5\frac{1}{4}$  oz. best white gum elemi and 21 dr. Venetian turpentine. Let this mixture stand in a warm place; stir it frequently. Filter; press out the remainder, and add to the filtrate. This varnish may be colored if desired.

*Tools, Lacquer for.*—The tools must be cleaned and polished so as to be absolutely free from grease. They are next slightly warmed and varnished with a solution of seed lac or shellac in alcohol. The success of the operation depends on the clearness of the surface. A finger touch before varnishing will affect the finish.

*Transparent Lacquer.*—Powdered gum sandarac, 4 parts; turpentine, 7 parts; spirit of turpentine, 28 parts. Dissolve the turpentine and the powdered gum sandarac over a water bath, in the spirit of turpentine. Before this varnish is used the bottle should be exposed to the sun for about an hour.

*Zinc, Lacquer for.*—A good lacquer consists of: Alcohol, 8 oz.; gamboge, 1 oz.; shellac, 3 oz.; annatto, 1 oz.; solution of 3 oz. of seed lac in 1 pt. of alcohol. When dissolved, add  $\frac{1}{4}$  oz. of Venice turpentine and  $\frac{1}{4}$  oz. of dragon's blood to make it dark. Keep in a warm place for 4 or 5 days.

### PAINTS

1.—300 parts washed and sieved white sand, 40 parts precipitated chalk, 50 parts rosin and 4 parts linseed oil are mixed and boiled in an iron kettle, and then 1 part oxide copper and 1 part sulphuric acid are added. This mass is supplied with an ordinary paint brush while warm. If it is too thick it is diluted with linseed oil. This paint dries very rapidly,

### (Paints, Anti-Corrosion)

and gets very hard, but protects wood work excellently.

2.—Skim milk, 2 qt.; fresh slaked lime, 8 oz.; linseed oil, 6 oz.; white Burgundy pitch, 2 oz.; Spanish white, 3 lb. The lime to be slaked in water, exposed to the air, and mixed in one-fourth the milk. Dissolve the pitch in the oil and add a little at a time. Then add the rest of the milk and the Spanish white.

### Aluminum Paint.

Aluminum, when reduced to fine powder and mixed with a solution of gum lac in water, gives a metallic paint which covers well, and which may be tinted with aniline dyes soluble in water. The solution of lac is made as follows: Soda crystals, 8 oz.; borax, 8 oz.; gum lac, 2 lb.; water, 1 gal. Boil the water and soda crystals and borax together, then add the lac, keep boiling till lac is dissolved. If this solution comes too thick, add more water and borax (1 oz. borax to 1 pt. of water). To this solution, aluminum, finely powdered, is added in sufficient quantity to produce a paint sufficiently fluid to apply with a brush. This paint is brilliant, durable, and impermeable, and is suitable for wood, metals, paper and cloth. If required more elastic, add 1 oz. glycerine to every gallon of lac solution.

### Asbestos Paints. (See Fireproof Paints.)

### Anti-corrosion Paint.

1.—An Anti-corrosion Paint for Iron.—If 10% of burnt magnesia, or even baryta or strontia, is mixed cold with ordinary linseed oil paint, and then enough mineral oil to develop the alkaline earth, the free acid of the paint will be neutralized, while the iron will be protected by the permanent alkalinizing action of the paint. Iron to be buried in damp earth may be painted with a mixture of 100 parts of rosin (colophony), 25 of gutta percha, and 50 of paraffine, to which 20 of magnesia and some mineral oil have been added.

2.—Take equal parts by weight of whitening and white lead, with half the quantity of fine sand, gravel, or road dust, and a sufficient quantity of coloring matter. This mixture is made in water and can be used as a water color; but it is more durable to dry it, as cakes or powder, after mixing, and then use it as an oil paint by grinding it again in linseed oil. The preparation of oil recommended for this purpose is: 12 parts by weight of linseed oil; 1 part boiled linseed oil and 3 parts sulphate of lime, well mixed. 1 gal.

## Paints, Varnishes, Etc.

### (Paints, Blackboard)

of this prepared oil is used to 7 lb. of the powder.

#### Bicycle Paint (Glossy Black).

1.—Amber, 8 oz.; linseed oil, 4 oz.; asphaltum,  $1\frac{1}{2}$  oz.; rosin,  $1\frac{1}{2}$  oz.; oil turpentine, 8 oz. Heat the linseed oil to boiling point, add the amber, asphaltum and rosin, and when all melted remove the heat and gradually add the turpentine.

2.—Oil tar, 4 oz.; asphaltum, 1 oz.; rosin, powdered, 1 oz. Mix and dissolve with the aid of heat, care being taken to prevent contact with the flame.

#### Bird Cages, To Paint.

Paint with zinc. Do not use lead. The zinc can be given any desired tint. It is then coated with light polishing copal varnish, after which it is baked or heated at from 100 to 150° F. The varnish known in the trade as extra light polishing varnish is used by several of the prominent bird-cage makers.

#### Black.

*Cheap Glossy Black Paint.*—Gum amber, 16 oz.; melt in boiling linseed oil,  $\frac{1}{2}$  pint; add genuine asphaltum and rosin, each 3 oz. Mix thoroughly over a fire, remove to open air and gradually add 1 pt. of oil of turpentine slightly warmed.

#### Blackboards, Paint or Slating for.

1.—Paint the board with ordinary black paint such as will dry with a gloss; then apply a coat of black paint, mixed with turps instead of oil, which will dry a dead black.

2.—Take  $\frac{1}{2}$  lb. logwood and sufficient boiling water to cover it; allow it to stand for 24 hours. Strain, and apply the solution, boiling, if possible, twice, allowing the board to dry in the interval. Then dissolve  $\frac{1}{4}$  lb. of copperas in about 1 pt. of boiling water, and apply it, boiling, once or twice, according to the degree of blackness obtained. Before using it, rub it over well with rushes, straw, ferns, or shoemakers' heel ball. It may be a little difficult to rub the chalk off at first, but after a fortnight's use that will disappear. Use unprepared chalk, which writes well.

3.—Place  $\frac{1}{4}$  lb. of lampblack on a flat piece of tin or iron on a fire till it becomes red, take it off and leave it until sufficiently cool, when it must be crushed with the blade of a knife on a flat board quite fine; then get  $\frac{1}{2}$  pt. of spirits of turpentine, mix both together, and apply the mixture with a size brush. If the board is new, it would be well to give

### (Paints, Branding)

it one or two coats of lampblack—not burnt, but mixed with boiled oil—adding  $\frac{1}{2}$  lb. of patent driers. After the board is thoroughly dried, apply the burnt lampblack and turpentine. The preparation must be laid on quickly.

4.—Dissolve 4 oz. shellac in 1 qt. of alcohol; add lampblack, 6 dr.; ultramarine blue, 1 dr.; pumice stone, powdered, 3 oz.; rotten stone, powdered, 2 oz. Have the board dry and free from grease.

Sodium silicate, diluted with water, and colored with lampblack, suspended in a little of the silicate, makes an excellent slating.

5.—Lampblack and flour of emery mixed with spirit varnish. No more lampblack and flour of emery should be used than are sufficient to give the required abrading surface. The thinner the mixture the better. Lampblack should be first ground with a small quantity of spirit of varnish or alcohol to free it from lumps. The composition should be applied to the smoothly planed surface of a board with a common paint brush. Let it become thoroughly hard and dry before it is used. Rub it down with pumice if too rough.

#### Boilers, Paint for.

1.—Use asphaltum varnish. There is little or no odor from it when dry.

2.—Coal tar and ground graphite thinned with turpentine make an excellent paint for boiler fronts and pipes in boiler room. The steam pipes for heating should not be painted, or if required, should only have a very thin coat of lampblack and linseed oil. Tin is unfit for roofs of boiler houses. Slate is best. You can make a temporary covering on the tin roof with asphalt and gravel. This will not save the tin, which will soon give out entirely. The cheapest way out of your trouble is to take off the tin and slate the roof.

3.—Rub it over with a mixture of boiled oil and lampblack. From the latter the grease should be taken before mixing by placing it in a flower pot, the top and bottom sealed with clay and subjected to a good heat.

#### Branding Paint (Red).

Take of shellac, 2 oz.; borax, 2 oz.; water, 25 oz.; gum arabic, 2 oz. Boil the borax and shellac in water until they are dissolved, add the gum arabic, and withdraw from the fire. When the solution has become cold, complete 25 oz. with water and add Venetian red enough to

## Paints, Varnishes, Etc.

### (Paint, Destroying)

bring it to a suitable consistency and color.

#### Canvas Paints.

*Buff.*—To light stone add: Ocher, 20 lb.; lemon chrome, 3 lb.; extra oil,  $\frac{1}{2}$  gal.

*Indian Red.*—Indian red, 112 lb.; whitening, 56 lb.; barytes, 63 lb.; half boiled oil and half raw oil, 6 gal.; soft soap, 7 lb.

*Light Stone.*—To Indian red add: Yellow ocher, 7 lb.; raw umber,  $\frac{1}{2}$  lb.

*White.*—White lead, 224 lb.; refined linseed oil, 15 lb.; soft soap, 7 lb.

#### Cleaning of Paint Brushes.

New paint brushes should be thoroughly brushed back and forth on the hand until the dust and loose hairs are removed. New brushes require special attention the first few days. All brushes should be washed in benzine or turpentine and shaken dry before changing from one tint to another. All paint brushes which have become clogged by paint should be freed up with turpentine before using. Varnish brushes should be kept in the same varnish in which they are used, or in turpentine; but the latter treatment will make the brushes rough in time, and the varnish is a much better preservative medium.

#### Colors. (See also *Mixing Paints*.)

##### Proportions of Colors for Ordinary Paints

Ingredients by weight.							
Colors.	White lead.	Lampblack.	Red lead.	Red ocher.	Verdigris.	Burnt umber.	Spanish brown.
White .....	100	..	..	..	..	..	..
Black .....	..	100	..	..	..	..	..
Green .....	25	..	..	75	..	..	..
Stone .....	99	..	..	..	1	..	..
Lead .....	98	2	..	..	..	..	..
Red .....	..	..	50	50	..	..	..
Chocolate .....	..	4	..	..	..	96	..

#### Destroying Paint.

Mix 1 part by weight of American pearlash with 3 parts quick stone lime by slaking the lime in water, and then adding the pearlash, making the mixture about the consistency of paint. Lay the above over the whole of the work required to be cleaned with an old brush; let it re-

### (Paints, Fireproof)

main 14 or 16 hours, when the paint can be easily scraped off.

#### Disinfecting Paint.

Disinfecting paints contain carbolic acid, boric or salicylic acid, from 1 to 2%. One such composition contains felspar, shellac, linseed oil, red lead, carbolic acid, and turpentine. The following is a dense white lead paint, which may be rendered antiseptic by the addition of any of the above-mentioned disinfectants: Dry white lead, 400 lb.; best zinc white, 600 lb.; linseed oil, 9 gal.; white japan, 10 gal.; turps, 6 gal.

#### Engines, Paints for.

*Engine Green (Light, Middle or Deep)*

1.—Brunswick green, 336 lb.; barytes, 81 lb.; Paris white, 28 lb.; boiled oil, 7 gal.

2.—Brunswick green, 168 lb.; barytes, 126 lb.; Paris white, 81 lb.; boiled oil, 7 gal.

3.—Green, 168 lb.; barytes, 210 lb.; Paris white, 70 lb.; boiled oil, 7 gal. To make ready for use thin with each 112 lb. of paint: boiled oil, 3 gal.; turps, 1 gal.; gold size, 1 gal.; patent driers, 14 lb.

4.—For olive green add to dark green: Vegetable black, 3 lb.

5.—For emerald green shade use zinc green instead of Brunswick green.

#### Fireproof Paints. (See also *Non-Inflammable Paint*.)

These paints dry with a hard enamel-like surface, which is fire and water proof, and gets harder by exposure to water and weather. A cheap and effective paint for large surfaces of plastic stucco cement, house fronts, etc. They are also adapted for factories, theaters, stores, etc., as a protection from fire. They may be tinted with the ordinary staining colors, but Prussian and Brunswick blues and greens, or any color affected by alkalis, must not be used.

*Asbestos Paints.*—1.—Asbestos is usually introduced into paints with the object of making them fireproof. Asbestos paints have not so much body as the ordinary oil paints, but as they are made with a special object this fact is not of primary importance.

2.—Prepared Asbestos.—Asbestos, carefully selected for white or light colors, is placed in a gas retort. Heat well to burn out all organic matter. Draw out into cold water, wash and grind in water under heavy stones. Float, dry, and sift. It is then ready to mix with the paint. If, owing to the presence of oxide of iron,



## Paints, Varnishes, Etc.

### (Paints, Fireproof)

it is then discolored, it must be boiled by steam with hydrochloric acid or sulphuric acid, or a mixture of the two acids diluted.

3.—**Asbestos Black.**—Prepared asbestos, 98 lb.; black oxide of manganese, 98 lb.; carbon black, 1 lb.; boiled linseed oil,  $3\frac{1}{2}$  gal. Any other colors may be made as desired. For use, thin with linseed oil and turps in equal proportions. A large quantity of turps in the thinnings enhances the fireproof qualities of the paint, as it evaporates in the drying, leaving the coat of paint freer from oil.

4.—**Asbestos Blue.**—Prepared asbestos, 98 lb.; ultramarine blue, 98 lb.; raw linseed oil, 4 gal.

5.—**Asbestos Green.**—Prepared asbestos, 98 lb.; middle Brunswick green, 98 lb.; boiled linseed oil,  $3\frac{1}{2}$  gal.

6.—**Asbestos Purple.**—Prepared asbestos, 98 lb.; purple oxide, 98 lb.; boiled linseed oil, 4 gal.

7.—**Asbestos Red.**—Prepared asbestos, 98 lb.; Venetian red, 98 lb.; boiled linseed oil,  $3\frac{1}{2}$  gal.

8.—**Asbestos Stone Color.**—Prepared asbestos, 98 lb.; zinc white, 98 lb.; zinc sulphide 24 lb.; raw umber, 6 lb.; boiled linseed oil, 4 gal.; turpentine,  $\frac{1}{2}$  gal.

9.—**Asbestos White.**—Prepared asbestos, 98 lb.; zinc white, 98 lb.; zinc sulphide, 24 lb.; refined linseed oil, 2 gal.; turpentine,  $\frac{1}{4}$  gal.

10.—**Asbestos White Lead.**—Prepared asbestos, 98 lb.; sulphate of lead, 70 lb.; zinc white, 28 lb.; refined linseed oil, 3 gal.

11.—**Asbestos Yellow.**—Prepared asbestos, 98 lb.; Oxford ochre, 98 lb.; raw linseed oil,  $3\frac{1}{2}$  gal.

**Black Fireproof Paint.**—Vegetable black, 42 lb.; mineral black, 42 lb.; whitening, 42 lb.; barytes, 140 lb.; silicate of soda, 72 lb.; water, 9 gal. Process.—As for White.

**Red Fireproof Paint.**—Venetian red, 112 lb.; whitening, 56 lb.; barytes, 112 lb.; silicate, 100 lb.; water, 10 gal. Process.—As for White.

**White.**—Zinc white, 168 lb.; white lead, 84 lb.; sulphate of zinc, 20 lb.; magnesia white, 90 lb.; silicate of soda, 30 lb.; refined linseed oil, 10 gal. Process.—Mix the dry materials well, and mix the oil with the silicate of soda. Mix all together in pug mill, not too full, as the mixture swells a little at first, and then grind well. The mixture may be thinned for use with silicate of soda and oil mixture or with linseed oil and turps in the usual manner, no driers being required.

### (Paints for Iron)

#### Funnel Paints for Yachts.

1.—Zinc white, 98 lb.; China clay, 98 lb.; ultramarine blue,  $\frac{1}{2}$  lb.; pale rosin oil, 2 gal.; silicate of soda, 20 gal. Process.—Mix well together and strain. This may be used independently, or with good effects over a previous coat of No. 3 white funnel paint, as the lime will prevent the zinc from discoloring.

2.—**Black Funnel Paint.**—Oxide of manganese, 119 lb.; bone black, 70 lb.; black lead, 10 lb.; rosin oil, 4 gal.; silicate of soda, 20 gal. Process.—As before. All require grinding, and when using should be constantly stirred.

3.—**Blue Funnel Paint.**—China clay, 189 lb.; ultramarine blue, 30 lb.; pale rosin oil, 4 gal.; silicate of soda, 18 gal. Process.—As before.

4.—**Cream Funnel Paint.**—White chalk lime, 84 lb.; whitening, 40 lb.; powdered litharge, 196 lb.; pale rosin oil, 4 gal.; silicate of soda, 20 gal. Process.—As before; add the litharge last, mixed with a little water.

5.—**Red Funnel Paint, Bright.**—White chalk lime, 84 lb.; whitening, 40 lb.; red lead, 196 lb.; pale rosin oil, 4 gal.; silicate of soda, 20 gal. Process.—As before. Should the mixture turn hard on the addition of the red lead, add more rosin oil and stir well in.

#### Grease Spots to Kill.

Before painting, wash the part with saltpeter, or very thin lime whitewash. If soap-suds are used, they must be washed off thoroughly, as they prevent the paint from drying hard.

#### Iron, Paints for.

A good cheap black paint or varnish for iron work is prepared as follows: Clear (solid) wood tar, 10 lb.; lampblack, or mineral black,  $1\frac{1}{4}$  lb.; oil of turpentine,  $5\frac{1}{2}$  qt. The tar is first heated in a large iron pot to boiling, or nearly so, and the heat is continued for about 4 hours. The pot is then removed from fire out of doors, and while still warm, not hot, the turpentine mixed with the black is stirred in. If the varnish is too thick to dry quickly, add more turpentine. Benzine can be used instead of turpentine, but the results are not so good. Asphaltum is preferable to the cheap tar.

**Protecting Iron.**—Cast-iron water pipes and other articles may be preserved by covering the inside and out with pitch, heated to 300° F. and kept at this point during the dipping. As the material deteriorates after a number of pipes

## Paints, Varnishes, Etc.

### (Paints, Lime)

have been dipped, fresh pitch is frequently added, and at least 8% of heavy linseed oil put to it daily; the vessel is also entirely emptied of the pitch and refilled with fresh material, as often as is necessary to insure the perfection of the process. Each casting is kept immersed from thirty to forty-five minutes, or until it attains a temperature of 300° F. After the bath is completed, the castings are removed and placed to drip in such a position that the thickness of the varnish will be uniform. It is essential that the coating be tenacious when cold, and not brittle or disposed to scale off. The pitch or varnish is made from coal tar, distilled until all the naphtha is removed, the material deodorized, and the pitch like wax or very thick molasses.

**Tar Paint for Ironwork.**—Tar, 191 lb.; sulphur, 7 lb.; red lead, 7 lb.; white lead, 7 lb. Process: Boil together until reduced in bulk one-half.

### Iron Paint.

A paint composed of pulverized iron and linseed oil varnish is intended for painting damp walls, kettles, outer walls, or any place or vessel exposed to the action of the open air and weather. Should the article be exposed to frequent changes of temperature, linseed oil varnish and amber varnish should be mixed with the paint intended for the first 2 coats, without the addition of any artificial drying medium. The first coat should be applied rather thin, the second a little thicker, and the last in a rather fluid state. It is not necessary to free iron from rust, grease, etc., by means of acid before applying the paint, as a superficial cleaning is sufficient. The paint is equally adapted as a weather-proof coating for iron, wood and stone.

### Lime Paints.

1.—For deal floors, wood, stone and brick work. Dissolve 15 dr. good glue by boiling with thickish milk of lime which contains 1 lb. caustic lime. Then add linseed oil, just sufficient to form a soap with the lime. This mixture can be used for making up any color which is not altered by lime. A solution of shellac in borax can be added for brown red or brown yellow colors, and is very suitable in painting deal floors. With a coating of varnish or lake, the substances thus painted assume a fine luster. They can be polished with linseed oil or turpentine.

2.—A lime paint which will bear washing: Three parts flint, 3 parts marble

### (Paints, Luminous)

fragments and sandstone, 2 parts calcined white China clay, and 2 parts slaked lime, all in powder, furnish a paint to which chosen colors that may be employed with lime are added. This paint, by repeated applications, becomes as hard as stone, without losing porosity.

### Luminous Paints and Colors.

The luminous calcic sulphide (also called sulphide of calcium) now obtainable in the market has a yellowish white tint, which considerably limits its direct application as a paint. On the other hand, the calcic sulphide, or the luminous paint obtained therefrom, loses its luminous property, if it is directly mixed with the ordinary commercial paints. An invention patented by Gustav Schatte, of Dresden, has for its object to produce durable white or colored paints, containing a luminous substance, which causes them to shine in the dark, without changing or neutralizing in daylight the tint of the coloring substance or substances contained in such paints.

Zanzibar or Kauri copal is melted over a charcoal fire. Fifteen parts of the melt are dissolved in 60 parts of French oil of turpentine and the filtered solution is mixed with 25 parts, previously heated and cooled, pure linseed oil. The varnish which is thus obtained is used in the following methods, in the manufacture of luminous paints, by grinding between granite rolls in a paint mill. Iron rolls should be avoided, because particles of iron, which are liable to be detached, would injure the luminous properties.

Varnishes, as they occur in commerce, generally contain lead or manganese, which would destroy the phosphorescence of calcium sulphide.

1.—For luminous oil color paints, equal quantities of pure linseed oil are used in the place of the varnish. The linseed oil must be cold pressed and thickened by heat. All the above luminous paints can be used in the manufacture of colored papers, etc., if the varnish is altogether omitted, and the dry mixtures are ground to a paste with water.

2.—The luminous paints can also be used as wax colors for painting on glass and similar objects by adding, instead of the varnish, 10% more of Japanese wax and  $\frac{1}{4}$  the quantity of the latter of olive oil. The wax colors prepared in this way may also be used for painting upon porcelain, and are then carefully burned without access of air. Paintings of this kind can also be treated with water glass. The latest use made of luminous paints in

## Paints, Varnishes, Etc.

### (Paints, Luminous)

England is the painting of harness, which is said to produce quite surprising effects in nocturnal driving.

3.—Boil together for an hour  $2\frac{1}{4}$  oz. caustic lime, recently prepared by calcining clean white shells at a strong red heat, with 1 oz. flowers of sulphur and 1 qt. of soft water. Set aside in a covered vessel for a few days, then pour off the liquid, collect the clear orange-colored crystals which have been deposited, and let them drain and dry on bibulous paper. Place the dried sulphide in a clear black lead crucible provided with cover. Heat for half an hour at a temperature just short of redness, then quickly for about fifteen minutes at a white heat. Remove cover and pack in clay until cold. The addition of a small quantity of pure calcium fluoride to the sulphide before heating it is made. It may be mixed with alcoholic copal varnish.

**Blue.**—A blue luminous paint is prepared from 42 parts varnish, 10.2 parts prepared barium sulphate, 6.4 parts ultramarine blue, 5.4 parts cobalt blue and 46 parts luminous calcium sulphide.

**Gray.**—45 parts of varnish are mixed with 6 parts prepared barium sulphate, 6 parts prepared calcium carbonate, 0.5 part ultramarine blue, 6.5 parts gray zinc sulphide.

**Green.**—1. 48 parts varnish are mixed with 10 parts prepared barium sulphate, 8 parts chromium oxide green and 34 parts luminous calcium sulphide.

2.—Varnish, 24 parts; barium sulphate, 5 parts; chromium oxide, green, 4 parts; luminous calcium sulphide, 17 parts.

**Orange.**—46 parts varnish are mixed with 17.5 parts prepared barium sulphate, 1 part prepared Indian yellow, 1.5 parts prepared madder lake and 38 parts luminous calcium sulphide.

**Red.**—60 parts varnish are mixed with 8 parts prepared barium sulphate, 2 parts prepared madder lake, 6 parts prepared realgar (red arsenic sulphide) and 30 parts luminous calcium sulphide and treated the same as for white paint.

**Violet.**—1.—Leonard's.—Strontium carbonate, by weight, 100 parts; sulphur, by weight, 100 parts; potassium chloride, by weight, 0.5 part; sodium chloride, by weight, 0.5 part; manganese chloride, by weight, 0.4 part. The materials are heated for three-quarters of an hour to one hour to about  $2372^{\circ}$  F. The product gives a violet light.

2.—42 parts varnish, 10.2 parts prepared barium sulphate, 2.3 parts ultramarine violet, 9 parts cobalt arsenate and 36 parts luminous calcium sulphide.

### (Paints for Metals)

**White.**—Mix 40 parts of the varnish, obtained in the above described process, with 6 parts prepared barium sulphate, 6 parts prepared calcium carbonate, 12 parts prepared white zinc sulphide and 36 parts good luminous calcium sulphide in a proper vessel to an emulsion and then grind it very fine in a color mill.

**Yellow.**—1.—48 parts varnish are mixed with 10 parts prepared barium sulphate, 8 parts barium chromate and 34 parts luminous calcium sulphide.

2.—A yellowish brown luminous paint is obtained from 48 parts varnish, 10 parts precipitated barium sulphate, 8 parts auriferous pigment and 34 parts luminous calcium sulphide.

3.—Luminous colors for artists' use are prepared by using pure East India Poppy oil, in the same quantity, instead of the varnish, and taking particular pains to grind the materials as fine as possible.

### Magnets, Red Paint Used on.

The "paint" used on magnets is usually non-conducting shellac varnish, carrying cinnabar. Try the following formula: Cinnabar, pulverized, 3 parts; Venice turpentine, 2 parts; shellac, pale, 1 part; alcohol, 95%, sufficient. Melt turpentine and shellac, remove from fire, let cool down to about  $140^{\circ}$  F. and add 10 parts of the alcohol. Rub up the cinnabar with sufficient alcohol to make a paste, and add it to the melted mixture. Put on a water bath for a few minutes, and stir continuously until a smooth, homogeneous fluid is obtained. Remove from fire and stir until cold. Preserve in well-stoppered vials, and when desired for use return to the water bath and heat until the liquid can be applied with a brush. The magnet should be warmed before applying.

### Marine Paint.

For metals in salt water, red lead, 44 parts; quicksilver, 24 parts; thick turpentine, 53.5 parts. Mix to proper consistency with boiled linseed oil. Grind or rub the thick turpentine and quicksilver together until thoroughly amalgamated. Then grind this mixture with the red lead and more boiled oil. Use as little oil as is necessary to make the paint lay on well. A coat of oxide of iron paint may be used first to make the marine paint adhere firmly.

### Metals, To Paint.

Paint frequently peels off when exposed to the weather. If the metal is slightly corroded by a solution of copper sulphate slightly acidulated with nitric acid the

## Paints, Varnishes, Etc.

### (Paints, Mixing)

paint will better adhere to the metal surface. After standing an hour or so, wash, dry and paint.

**Proof Against Hot Water.**—Clean the metal with turpentine or benzine. Put on two coats of a mixture of white lead, spirits of turpentine and carriage varnish. Follow immediately with a thick coat of carriage varnish and white lead.

**White Paint for Metallic Surfaces.**—Oil paints used on metallic surfaces exposed to heat frequently turn yellow. If instead of oil sodium silicate be used no change of color will be noticed. Zinc white mixed with soluble glass of from 40° to 50° B., to the consistency of ordinary paint, makes an excellent paint for metals.

### Mica Luster Paint.

Clean mica powder, 84 lb.; pale boiled oil, 14 gal. The above paint is nearly transparent and is intended to be applied over other paint to produce a peculiar silvery or sealy glittering appearance, varying in different lights, and is very effective on certain classes of work, such as wood-work in refreshment rooms, bars, etc. Small quantities of color may be introduced, but the best effects are obtained by its use over other colors.

**Preparing Mica for Use in Above.**—Place in crucibles or retorts and make red hot and draw into water or boil in dilute muriatic acid. After either of the above processes it has to be ground in water and dried and powdered. It is fire-proof and will rival asbestos as a fire-proof paint, but possesses no opacity, so that its use is purely decorative.

### Mixing Paints. (See also Colors.)

In mixing paints, observe that for outdoor work you must use principally or wholly boiled oil, unless it be for the decorative part of houses, etc.; then mix as for indoor work. For indoor work use linseed oil, turpentine and a little drier, observing that the less oil the less will be the gloss, and that for flatted white, etc., the color being ground in oil, will scarcely require any further addition of that article, as the object is to have it dull. The best driers are ground litharge and sugar of lead; the former for dark and middle tints and the latter for light ones.

**Oil Colors.**—In mixing different colored paints to produce any desired tint, it is best to have the principal ingredient thick, and add to it the other paints thinner. In the following list of the combinations of colors required to produce a required tint the first named color is the principal

### (Paints for Oilcloths)

ingredient, and the others follow in the order of their importance. Thus, in mixing a limestone tint, white is the principal ingredient and red the color of which least is needed, etc., the exact proportions of each depending on the shade of color required.

List of compound colors, showing the simple colors which produce them:

Buff—White, yellow ochre, red.  
Chestnut—Red, black, yellow.  
Chocolate—Raw umber, red, black.  
Claret—Red, umber, black.  
Copper—Red, yellow, black.  
Dove—White, vermilion, blue, yellow.  
Drab—White, yellow ochre, red, black.  
Fawn—White, yellow, red.  
Flesh—White, yellow ochre, vermilion.  
Freestone—Red, black, yellow ochre, white.  
French Gray—White, Prussian blue, lake.  
Gray—White lead, black.  
Gold—White, stone ochre, red.  
Green Bronze—Chrome, green, black, yellow.  
Green Pea—White, chrome green.  
Lemon—White, chrome yellow.  
Limestone—White, yellow ochre, black, red.  
Olive—Yellow, blue, black, white.  
Orange—Yellow, red.  
Peach—White, vermilion.  
Pearl—White, black, blue.  
Pink—White, vermilion, lake.  
Purple Violet, with more red and white.  
Rose—White, madder lake.  
Sandstone—White, yellow ochre, black, red.  
Snuff—Yellow, Vandyke brown.  
Violet—Red, blue, white.

### Non-Inflammable Paint. (See also Fire-proof Paints.)

To a gallon of a mixture of equal parts of lime water and vinegar add  $\frac{1}{2}$  lb. salt,  $\frac{1}{4}$  lb. alum,  $\frac{1}{4}$  lb. white vitriol, each in the form of powder. The mixture is then boiled, 1 gal. of linseed or other drying oil is added, and the boiling repeated. After the addition of 1 gal. of crude petroleum, the mixture is once more heated to the boiling point and is then ready for use. A solution of silicate of soda used with ordinary distemper will render it fireproof.

### Oilcloths, Flexible Paints for.

1.—Size with hot soap and alum solutions, used alternately, dry and enamel with colors ground fine in oil with plenty of driers and a little turpentine. Enamel

## Paints, Varnishes, Etc.

### (Paints, Rubber)

with a thin copal varnish if high gloss is desired. Harden by drying at about 200° F.

2.—The following retains sufficient flexibility to enable the sheet to be rolled: Soft soap, 2 oz.; boiling water, 12 oz. Dissolve and work well into usual oil paint, 6 lb.

**Oil Colors.** (See *Mixing Paints*, above, and our *Scientific American Supplement*, No. 1706.)

#### Oil Paint, White Substitute for.

A substitute for white oil paint may be made as follows: Skim milk, 4 qt.; fresh slaked lime, 1 lb.; linseed oil, 12 oz.; white Burgundy pitch, 4 oz.; Spanish white, 6 lb., to be mixed as follows: The lime to be slaked in water, exposed to the air, mixed in about  $\frac{1}{4}$  of the milk; the oil, in which the pitch must be previously dissolved, to be added a little at a time, then the rest of the milk, and afterward the Spanish white. This quantity is sufficient for more than 50 square yards covered with two coats.

#### Outdoor Work, Durable Paint for.

Grind powdered charcoal in linseed oil, with sufficient litharge as a drier. Thin for use with boiled linseed oil.

#### Red Oxide of Iron Paints.

1.—*Bright Red Paint*.—Pure bright red oxide, 336 lb.; common barytes, 112 lb.; China clay, 112 lb.; whitening, 112 lb.; raw linseed oil, 9 gal.

2.—*Specialty Red Oxide Paint for Gasometers, etc.* Red oxide, 392 lb.; barytes, 784 lb.; whitening, 84 lb.; boiled linseed oil, 112 lb.; raw oil, 224 lb.; varnish bottoms, 58 lb.; turpentine, 42 lb.; driers, 224 lb.

3.—*Turkey Red Paint*.—Pure bright red oxide, 448 lb.; raw linseed oil, 10 gal. A little varnish foots should also be used. Note. A turkey red (dry) must be a very fine, bright, strong pigment, better than a super-Venetian red.

#### Roof Paint, Elastic.

The following formula yields a paint which is water and weather proof, suitable for wood or metal, and very lasting: Gum shellac,  $\frac{1}{2}$  lb.; soft water, 1 gal.; common soda, 1 oz. Place on fire, keep hot, but do not boil. When all is dissolved (say in 1 to 2 hours), remove and put in cans.

#### Rubber Paint.

An extremely enduring paint may be made by first macerating rubber in any of the solvents until of a pasty consistency, next dissolving it in linseed oil heated

### (Paints, Silicate)

until the solvent is evaporated, and then mixing in by grinding a proportionate quantity of graphite.—*Matthews.*

#### Sail Cloth Paints.

*Drab.* Dark boiled oil, 4 gal.; burnt umber, 35 lb.; patent driers, 63 lb.; white lead, 56 lb.; raw linseed oil, 2½ gal.; turps, 2 gal.; soft soap, 3 lb.; glycerine, 1 pt.

*Stone Buff.*—White lead, 56 lb.; yellow ochre, 42 lb.; orange chrome, 7 lb.; boiled oil, 4¼ gal.; raw oil, 1½ gal.; patent driers, 63 lb.; soft soap, 3½ lb.; glycerine, 1 pt.

#### Ship, Submarine Works, etc.

Concentrated solution of 160 lb. potash; grape sugar, 80 lb.; add a solution of 320 lb. sulphate of copper. When this solution is heated a precipitate of hydrated oxide of copper is formed; this is filtered, carefully dried and mixed with 6¼ lb. 75% carbolic acid. Heat the mass and add about 9½ gal. crude linseed oil. When this paint is to be used, reduce with linseed oil. It is said to be poisonous to animal and vegetable bodies depositing themselves on vessels.

*Anti-fouling Compositions.*—(See the *Scientific American Supplement*, No. 1536.)

#### Silicate Paints.

1. When the surface to be painted is of a mineral nature, such as the exterior of a house, the pigments may be mixed with a vehicle consisting chiefly of water glass, or soda or potash silicate. This method of painting requires some care, and a knowledge of the chemical nature of the pigments used. Some colors are completely destroyed by the alkali contained in the water glass. Among those pigments which are not altered by the alkali may be mentioned lime carbonate, baryta white, zinc white, cadmium yellow, Naples yellow, baryta chromate, chrome red, red ultramarine, blue ultramarine, cobalt blue, cobalt green, chrome green, ivory black. When a wall is to be painted it should first be prepared with a mortar composed of pure fat lime and clean sharp sand. The water used should also be free from saline impurities, as these might subsequently effloresce and destroy the surface of the paint. When the surface of this plaster is dry, a weak solution of water glass should be applied, and the operation repeated several times.

2.—Dilute silicate of soda solution until it works well with the brush, and add dry coloring matter, such as will not be de-

## Paints, Varnishes, Etc.

### (Paints, Tungsten)

composed by the chemical. Ochres, Venetian red, smalts, umbers and siennas may be employed.

#### Stacks, Paint for.

1.—Dissolve asphaltum in turpentine with the application of a gentle heat. Use when cold. Apply with a brush.

2.—Paint the stack with thin coal tar mixed with finely ground plumbago. Make of the consistency of ordinary paint.

#### Stencil Paints.

Take shellac, 2 oz.; borax, 2 oz.; water, 25 oz.; gum arabic, 2 oz.; lampblack, a sufficiency. Boil the borax and shellac in water till they are dissolved, and withdraw from the fire. When the solution has become cold, complete 25 oz. with water and add lampblack enough to bring the preparation to a suitable consistency. When it is to be used with a stencil, it must be made thicker than when it is to be applied with a marking brush. The above gives a black ink; for red, substitute Venetian red for lampblack; for blue, ultramarine, and for green, a mixture of ultramarine and chrome yellow.

#### Stoves, Paint for Sample.

Paint the stove with paint made of powdered black lead and linseed oil, and polish in the ordinary way when dry. It may be left out in all kinds of weather without injury to the polish.

#### Temperature Indicated by Paint.

According to Tonner, 100 parts each of iodide of mercury and iodide of copper are carefully rubbed down with sufficient distilled water to produce a spreadable paste. The color of this combination, at ordinary temperature, is red; at about 140° F. it turns black, but goes back to its red color on cooling. It is admirably adapted to show the heating of machine parts in inaccessible places.

#### Toys, Innoxious Color for Painting.

White fine chalk, 6 parts; calcined magnesia (thoroughly calcined), 3 parts. Add a few drops of indigo solution.

#### Trunk Paint (Quick-drying).

*Black.*—Brown hard varnish, 1 gal.; mineral black,  $\frac{1}{2}$  lb.; zinc sulphide, 1 lb.; methylated spirit, 1 pt.

*Buff.*—Brown hard varnish, 1 gal.; lemon chrome, 2 lb.; sulphide of zinc, 1 lb.; ochre,  $\frac{1}{2}$  lb.; methylated spirit, 1 pt.

#### Tungsten Paints.

The mineral colors from tungsten are obtained by decomposing soluble tung-

### (Paints, Water)

states by means of salts of the metals yielding insoluble phosphates. The tungstate of nickel produces a light green, tungstate of chromium a dark gray, tungstate of cobalt a violet or indigo blue and tungstate of barium a bright white color. Tungstic acid alone gives a fine light greenish yellow. All these colors may be employed for water or oil color paints; the last is a really desirable and probably quite unchangeable color.

#### Washable Paints.

Herewith we give a complete series of the chief washable paints. This term is often reserved for water paints; as oil paints are naturally understood to be washable, but the following are oil and varnish mixings, which are inserted at this point for convenience and ready comparison with water and silicate paints.

*Brickwork or Plaster.*—Fine whiting, 112 lb.; boiled linseed oil, 35 lb. Process as before. No driers required. May be thinned with paraffine oil.

*Paper.*—Fine whiting, 112 lb.; common oak varnish, 35 lbs. Process: Cover the whiting with water and allow to stand 5 or 6 hours, then remove the water not absorbed by the whiting and beat the pulpy mass to the consistency of batter, add the varnish and mix well till of a creamy consistency. Stain to shade required by using colors ground in boiled linseed oil.

*Woodwork.*—Fine whiting, 112 lb.; boiled linseed oil, 35 lbs. Process: Treat the whiting as before, add the boiled linseed oil, stir well together, and stain as before. A small quantity of patent driers may be added if desired. Thin with turps and raw linseed oil in equal quantities.

#### Water Paint.

Slake any quantity of stone lime by putting it in a tub and covering up to keep in the steam. When slaked pass through a fine sieve, and to each 6 qt. of lime add 1 qt. of rock salt in powder and 1 gal. of water. Boil all together and skim clean. To each 5 gal. of this liquid add powdered alum, 1 lb.; powdered green copperas,  $\frac{1}{2}$  lb.; add very slowly powdered caustic potash,  $\frac{3}{4}$  lb.; fine sand, 4 lbs. Thoroughly mix together and apply with a brush. When dry is as durable as slate, and if used on brick or stone walls will render the latter impervious to wet. For buff use 1 lb. of Oxford ochre to 1 gal. of liquid. For stone use  $\frac{1}{2}$  lb. of ochre to 1 gal. of liquid.

*Silicate of Soda Water Paint.*—The following process will yield good results and will give a paint which may be used as a

## Paints, Varnishes, Etc.

### (Paints, Waterproof)

water or oil paint by thinning with water, or in the ordinary manner by the use of linseed or boiled oil, or it may be mixed ready for use by the addition of the silicate oil substitute. With the exception of blues of the Prussian class, Brunswick greens, and, to some extent, chromes, all colors may be ground with this oil substitute.

*Liquid.*—1.—Silicate of soda, 45° Beaumé, 112 lb.; pale rosin, 28 lb.; water, 20 gal.

2.—Silicate of soda, 45° Beaumé, 112 lb.; black rosin, 28 lb.; water, 20 gal. Process: Boil the water and silicate of soda together, and, while boiling, sift in the rosin, which should be coarsely powdered, stirring all the while. Boil till the rosin is all dissolved, then strain through coarse canvas. Mix with oil in the following proportions:

*Oil Substitute.* 1.—No. 1 liquid, 112 lb.; raw linseed oil, 112 lb.

2.—No. 2 liquid, 112 lb.; boiled linseed oil, 112 lb. These oils dry well, and with a moderate gloss, and harden with exposure.

#### Waterproof Water Paint.

A waterproof paint may be made by dissolving in 2 qt. of water 1 lb. brown soap and then adding 6 qt. boiled oil and 1 oz. vitriol. After removing from the fire, add 2 qt. turpentine with any color it is desired to mix with it. Strain well and thin with turpentine.

*Black Waterproof Paint.*—Carbon black, 10 lbs.; Paris white, 90 lbs.; barytes, 60 lb.; litharge, 21 lb.; white lead, 21 lb.; soft soap, 17 lb.; boiled oil, 10 lb.; raw linseed oil, 10 lb.; water, 100 lb. May also contain varnish.

*Elastic Waterproof Paint.* 1.—There are a large number of mixtures used as bases for these paints, but it depends really upon the ultimate or special use of the paint when deciding upon a medium. The following makes suitable application for horse, rick and sail cloths, tents, shop blinds, etc. It will dry fairly quickly and the coating will prove efficient for quite a considerable period, but two or even three coats should be laid on, and then the resistance to wet will endure as long as the fabric of the sheet itself. Any other color would be produced by substituting the pigment desired for that in the recipe.

2.—Black.—Boiled oil, 5 gal.; turps, 4 gal.; bone black, 17 lb.; yellow soap, 2½ lb.; Chinese blue, 1 lb.

*Emulsion Waterproof Paint.*—Ocher, 96 lb.; lampblack, 16 lb.; boiled linseed oil, 42 lb. This quantity of boiled oil

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must be decreased or increased if the resulting consistency is not satisfactory when mixed. It depends upon the absorptive properties of the ocher and lampblack. Then add yellow soap, 2 lb., dissolved in water (hot), 1 gal., and reduce, if necessary, to the consistency of thick varnish with more boiled oil. Any color can be obtained by using the usual pigments.

*Liquid Gold Paint.*—Dextrine, 400 gr.; bichromate of potash, 1 gr.; bronze powder, 65 gr.; water, as may be required.

*White Waterproof Paint.*—Zinc oxide, 112 lb.; genuine white lead (ground in oil), 112 lb.; barytes, 122 lb.; Paris white, 336 lb.; linseed oil, 88 lb.; soft soap (potash), 56 lb.; water (26 gal.), 260 lb.; also 1½ gal. extra pale copal varnish.

#### Window Paint.

Mix with white lead, boiled oil or varnish, and a small quantity of driers (no turps, which hardens for the time, being a volatile oil, and therefore objectionable in this case); paint this over the glass thinly, and stipple it. If you have not a proper brush, make a large plectrum of cotton wool or tow, cover it with a clean bit of linen rag, and quickly dab it over the paint.

#### Zinc.

*To Prepare for Painting.*—Dissolve 1 part of chloride of copper, 1 part of nitrate of copper and 1 part of sal ammoniac in 64 parts of water and add 1 part of commercial hydrochloric acid. Brush the zinc over with this, which gives it a deep black. Leave to dry 24 hours, when any oil color will firmly adhere to it, and withstand both heat and damp.

*To Protect Roofing from Rust.*—Zinc sheets for roofing can easily be protected against rust by the following simple process: Clean the plates by immersing them in water to which 5% of sulphuric acid has been added, then wash with pure water, allow to dry and coat with asphalt varnish. Asphalt varnish is prepared by dissolving 1 to 2 parts asphalt in 10 parts benzine; the solution should be poured evenly over the plates and the latter placed in an upright position to dry.

#### SIZE

*Gold Size.*—1.—(Oil Size).—Drying or boiled oil thickened with yellow ocher or calcined red ocher, and carefully reduced to the utmost smoothness by grinding. It is thinned with oil of turpentine. Improves by age. Used for oil gilding.

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### (Size)

2.—(Water Size).—Parchment or isinglass size mixed with finely ground yellow ochre. Used in burnished or distemper gilding.

3.—Place boiled oil in a stone pot and place on a gentle fire, and allow the heat to rise almost to the point of ignition, then set fire to it, and let it burn until it is thick, then put on the cover to extinguish the flames. Now strain through silk and thin with turpentine.

4.—The following is highly recommended: Heat slowly 8 oz. best drying oil and just before it comes to a boil add 2 oz. gum animi, boil until of the consistency of tar, then strain through silk. A little finely ground vermilion may be added if desired. Thin with turpentine. Dilute with oil of turpentine.

5.—Gold size is prepared from  $\frac{1}{2}$  lb. linseed oil with 2 oz. gum animi; the latter is reduced to powder and gradually added to the oil while being heated in a flask, stirring it after every addition until the whole is dissolved; the mixture is boiled until a small quantity, when taken out, is somewhat thicker than tar, and the whole is strained through a coarse cloth. When used, it must be ground with as much vermilion as will render it opaque, and at the same time be diluted with oil of turpentine, so as to make it work freely with the pencil.

6.—Black Gold Size.—Triturate 1 oz. gold size with enough lampblack to form a dense color. Thin with turpentine.

7.—Japanners' Gold Size.—Lead acetate,  $\frac{1}{4}$  lb.; gum animi, 4 lb.; turpentine,  $1\frac{3}{4}$  gal.; drying oil, 1 gal. Boil the gum in the oil for 4 hours, add the other materials and strain.

*Ivory Size or Jelly.*—Boil ivory dust or ivory shavings in water. This forms a beautiful size or jelly.

*Painters' Size.*—Boil raw oil in a pan till a black smoke emits therefrom; then set it on a fire, and, after burning for a few minutes, cover the pan to put out the blaze; pour the oil while warm into a bottle in which some pulverized red lead and litharge have been introduced. Stand the bottle in a warm place for 2 weeks, shaking often. It will then be ready to decant and bottle.

*Parchment Size.*—This consists of gutta percha softened and extended in ether. It furnishes a preservative coating for pictures, cards, etc. Any extraneous matter is easily removed by means of a damp cloth. Easily effaceable charcoal or chalk drawings are fixed if this solution be distributed over their surface in fine spray. The ether evaporates and leaves

### (Stains)

the gutta percha, which forms an extremely thin but protective coating over the design.

*Sizing for Sign Work.*—One of the best mordants or sizing for sign work is made by exposing boiled linseed oil to a strong heat in a pan; when it begins to smoke, set fire to the oil, allow it to burn a moment, and then suddenly extinguish it by covering the pan. When cold it will be ready for use, but will require thinning with a little turpentine.

### STAINS

These exceedingly useful and salable articles are usually prepared by tinting a suitable spirit varnish with various soluble aniline dyes (walnut, oak, mahogany, etc.). The varnish is usually of the nature of a brown hard for the darker shades and white hard for the lighter shades. The dyes can be procured under the names spirit walnut, spirit oak, etc., from any dye manufacturer.

The best woods for staining are those of close, even texture, as cherry, beech, birch and maple. The wood should be perfectly dry and planed and sandpapered very smooth. Nearly all of the stains should be applied hot, as this causes them to penetrate the pores more deeply. If the wood is to be varnished many of the dyes used in cloth dyeing may be used in alcoholic solutions, but the effect is not equal to the regular stain. In case the natural color of the wood prevents the wood being stained satisfactorily, bleach the wood by saturating with the following solution: Chloride of lime, 9 oz.; soda crystals, 1 oz.; water,  $2\frac{1}{2}$  qt. The wood may be bleached in this for  $\frac{1}{2}$  hour. Wash with a solution of sulphurous acid, then with water.

*Age. To Give an Appearance of.*—Boil  $\frac{1}{2}$  lb. madder and 2 oz. logwood chips in 1 gal. of water and brush well over while hot; when dry go over the whole with pearlash solution, 2 dr. to the qt.

1.—Boil  $\frac{1}{2}$  lb. logwood in 3 pt. of water and add  $\frac{1}{4}$  oz. salt of tartar. Stain the wood with the liquor boiling hot.

2.—Boil in  $\frac{1}{2}$  lb. madder and  $\frac{1}{4}$  lb. fustic in 1 gal. of water; use hot, as before.

*Varnish Base.*—1.—Powdered manilla copal, 56 lb.; powdered common rosin, 112 lb.; methylated spirit, 18 gal.

2.—Spirit copal, 84 lb.; turpentine varnish, 6 gal.; methylated spirit, 18 gal.

*Black.*—1.—Obtained by boiling together blue Brazil wood, powdered gall apples and alum in rain or river water until it becomes black. This liquid is



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then filtered through a fine organzine, and the objects painted with a new brush before the decoction has cooled, and this repeated until the wood appears of a fine black color. It is then coated with the following liquid: A mixture of iron filings, vitriol and vinegar is heated (without boiling), and left a few days to settle. Even if the wood is black enough, yet for the sake of durability it must be coated with a solution of alum and nitric acid, mixed with a little verdigris; then a decoction of galls apples and logwood dyes is used to give it a deep black. A decoction may be made of brown Brazil wood with alum in rain water, without galls apples; the wood is left standing in it for some days in a moderately warm place, and to it merely iron filings in strong vinegar are added, and both are boiled with the wood over a gentle fire. For this purpose soft pear wood is chosen, which is preferable to all others for black staining.

2.—1 oz. nutgall, broken into small pieces, put into barely  $\frac{1}{2}$  pt. vinegar, which must be contained in an open vessel; let stand for about  $\frac{1}{2}$  hour; add 1 oz. steel filings; the vinegar will then commence effervescing; cover up, but not sufficient to exclude all air. The solution must then stand for about  $2\frac{1}{2}$  hours, when it will be ready for use. Apply the solution with a brush or piece of rag to the article, then let it remain until dry; if not black enough, coat it until it is—each time, of course, letting it remain sufficiently long to dry thoroughly. After the solution is made, keep it in a closely corked bottle.

3.—Water, 1 gal.; logwood chips, 1 lb.; black copperas,  $\frac{1}{2}$  lb.; extract of logwood,  $\frac{1}{2}$  lb.; indigo blue,  $\frac{1}{2}$  lb.; lampblack, 2 oz. Put these into an iron pot and boil them over a slow fire. When the mixture is cool, strain it through a cloth, add  $\frac{1}{4}$  oz. nutgall. It is then ready for use. This is a good black for all kinds of cheap work.

4.—Cumpachy wood, 250 parts; water, 2,000 parts, and copper sulphate, 30 parts; the wood is allowed to stand 24 hours in this liquor, dried in the air, and finally immersed in iron nitrate liquor at  $4^{\circ}$  F.

5.—Boil 8  $\frac{3}{4}$  oz. logwood in 70 oz. water and 1 oz. bluestone, and steep the wood for 24 hours. Take out, expose to the air for a long time, and then steep for 12 hours in a beek of iron nitrate at  $4^{\circ}$  F. If the black is not fine, steep again in logwood liquor.

6.—It is customary to employ the clear

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liquid obtained by treating 2 parts powdered galls with 15 parts wine, and mixing the filtered liquid with a solution of iron protosulphate. Reimann recommends the use of water in the place of wine.

7.—Almost any wood can be dyed black by the following means: Take logwood extract such as is found in commerce, powder 1 oz., and boil it in  $3\frac{1}{4}$  pt. of water; when the extract is dissolved, add 1 dr. of potash yellow chromate (not the bichromate), and agitate the whole. The operation is now finished, and the liquid will serve equally well to write with or to stain wood. Its color is a very fine dark purple, which becomes a pure black when applied to the wood.

8.—For black and gold furniture, procure 1 lb. logwood chips, add 2 qt. of water, boil 1 hour, brush the liquor in hot, when dry give another coat. Now procure 1 oz. of green copperas, dissolve it in warm water, well mix, and brush the solution over the wood; it will bring out a fine black; but the wood should be dried outdoors, as the black sets better. A common stove brush is best. If polish cannot be used, proceed as follows: Fill up the grain with black glue—i.e., thin glue and lampblack—brushed over the parts accessible (not in the carvings); when dry, smooth down with fine paper. Now procure, say, a gill of French polish, in which mix 1 oz. best ivory black, or gas black is best; shake it well until quite a thick pasty mass; procure  $\frac{1}{2}$  pt. of brown hard varnish, pour a portion into a cup, add enough black polish to make it quite dark, then varnish the work; two thin coats are better than one thick coat. The first coat may be glasspapered down where accessible, as it will look better. A coat of glaze over the whole gives a London finish. *N. B.*—Enough varnish should be mixed at once for the job to make it all one color—i. e., a good black.

9.—For Table.—Wash the surface of table with liquid ammonia, applied with a piece of rag; the varnish will then peel off like a skin; afterward smooth down with fine sandpaper. Mix  $\frac{1}{4}$  lb. lampblack with 1 qt. of hot water, adding a little glue size; rub this stain well in; let it dry before sandpapering it; smooth again. Mind you do not work through the stain. Afterward apply the following black varnish with a broad, fine camel's-hair brush: Mix a small quantity of gas black with the varnish. If one coat of varnish is not sufficient, apply a second one after the first is dry. Gas black can be obtained by boiling a pot over the gas,

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letting the pot nearly touch the burner, when a fine jet black will form on the bottom, which remove, and mix with the varnish. Copper vessels give the best black; it may be collected from barbers' warming pots.

10.—Boil 17.5 oz. of Brazil wood and 0.525 oz. of alum for 1 hour in 2.75 lb. of water. The colored liquor is then filtered from the boiled Brazil wood, and applied several times, boiling hot, to the wood to be stained. This will assume a violet color. This violet color can be easily changed into black by preparing a solution of 2.1 oz. of iron filings and 1.05 oz. of common salt in 17.5 oz. of vinegar. The solution is filtered, and applied to the wood, which will then acquire a beautiful black color.

11.—Boil 8.75 oz. of gallnuts and 2.2 lb. of logwood in 2.2 lb. of rain water for 1 hour in a copper boiler. The decoction is then filtered through a cloth and applied several times, while it is still warm, to the article of wood to be stained. In this manner a beautiful black will be obtained.

12.—This is prepared by dissolving 0.525 oz. of logwood extract in 2.2 lb. of hot rain water, and by adding to the logwood solution 0.035 oz. of potash chromate. When this is applied several times to the article to be stained, a dark brown color will first be obtained. To change this into a deep chrome black, the solution of iron filings, common salt and vinegar, given under 10, is applied to the wood, and the desired color will be produced.

13.—Several coats of alizarine ink are applied to the wood, but every coat must be thoroughly dry before the other is put on. When the articles are dry the solution of iron filings, common salt and vinegar, as given in 10, is applied to the wood, and a very durable black will be obtained.

14.—According to Herzog, a black stain for wood, giving to it a color resembling ebony, is obtained by treating the wood with two fluids, one after the other. The first fluid to be used consists of a very concentrated solution of logwood, and to 0.35 oz. of this fluid are added 0.017 oz. of alum. The other fluid is obtained by digesting iron filings in vinegar. After the wood has been dipped in the first hot fluid, it is allowed to dry, and is then treated with the second fluid, several times, if necessary.

15.—Sponge the wood with a solution of aniline chlorhydrate in water, to which a small quantity of copper chloride is

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added. Allow it to dry, and go over it with a solution of potassium bichromate. Repeat the process 2 or 3 times, and the wood will take a fine black color.

10.—Put iron filings, or the scales from a smith's forge in a bottle, so as to fill it, say, a quarter full. Fill up with strong vinegar. Shake this up a couple of times a day for 3 or 4 days. Now boil some ground logwood in water, so as to make a strong decoction. Put this, while hot, on the wood, and before it is quite dry put on the vinegar and iron. When the wood is allowed to dry before the iron is put on the inner grain of the wood remains red in places. Oil to get a good black.

*Blue.*—1.—Place the following ingredients in a clean glass jar: Sulphuric acid, 4 oz.; powdered indigo, 1 oz. Stand the jar in an earthenware pan lest they boil over. When the effervescence has ceased add sufficient of the mixture to clean rain water as will give the requisite shade on a trial slip of wood. Then apply to the work, using a clean bristle brush. The color is much improved by keeping before use.

2.—Oxford Blue.—Methylated spirit, 5 gal.; orange shellac, 8 lb.; lemon rosin, 4 lb.; elemi, 3 lb.; fast acid blue, B., 4 oz.; azo-fuchsine, S., 1½ dr.

*Brown.*—1.—Various tones may be produced by mordanting with potash chromate, and applying a decoction of fustic, of logwood, or of peachwood.

2.—Sulphuric acid, more or less diluted, according to the intensity of the color to be produced, is applied with a brush to the wood, previously cleaned and dried. A lighter or darker brown stain is obtained, according to the strength of the acid. When the acid has acted sufficiently its further action is arrested by the application of ammonia.

3.—Tincture of iodine yields a fine brown coloration, which, however, is not permanent unless the air is excluded by a thick coating of polish.

4.—A simple brown wash is ½ oz. of alkanet root, 1 oz. of aloes, and 1 oz. of dragon's blood, digested in 1 lb. of alcohol. This is applied after the wood has been washed with aqua regia, but is, like all the alcoholic washes, not very durable.

*Buff.*—Methylated spirit, 5 gal.; orange shellac, 10 lb.; amber rosin, 2½ lb.; elemi, 2½ lb.; Indian yellow, G., 1½ dr.; lac orange, C., 1 dr.; azo-fuchsine, G., 1 dr.; fast green bluish, ¾ dr.

*Canary.*—Methylated spirit, 5 gal.; bleached shellac, 8 lb.; lemon rosin, 4

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lb.; elemi, 3 lb.; Indian yellow, G., 3 oz.; lac orange, C.,  $\frac{1}{2}$  oz.

**Cedar Wood Imitation.**—Small articles of whitewood can be given the appearance of cedar by means of a stain composed of 200 parts of catechu (Japanese earth), 100 parts of caustic soda and 1,000 parts of water. In this stain the articles must be boiled for several hours, then rinsed off and dried, and if they are not dark enough, boil over again. This stain penetrates so deeply into the wood that the colored articles can be worked over again.

**Cherry or Crimson Stain.**—1.—Alkanet root, 15 gr.; aloes, 30 gr.; powdered dragon's blood, 30 gr.; 95% alcohol, 500 gr. Mix, and let stand in a tightly corked bottle some days. Go over the wood with dilute (1 in 10) nitric acid first. This is pretty dark. You may lighten by using more alcohol.

2.—Methylated spirit, 5 gal.; lemon rosin, 7 lb.; garnet shellac, 4 lb.; orange shellac, 4 lb.; spirit of cherry, 8 lb.

**Ebonizing.**—1.—Boil 1 lb. of logwood chips 1 hour in 2 qt. of water; brush the hot liquor over the work to be stained, and lay aside to dry; when dry, give another coat, still using it hot. When the second coat is dry, brush the following liquor over the work: Green copperas, 1 oz., to 1 qt. of hot water, to be used when the copperas is all dissolved. It will bring out an intense black when dry. For staining, the work must not be dried by fire, but in the sunshine, if possible; if not, in a warm room, away from the fire. To polish this work, first give a coating of very thin glue size, and when quite dry smooth off very lightly with No. 0 paper, only just enough to render smooth, but not to remove the black stain. Then make a rubber of wadding about the size of a walnut, moisten the rubber with French polish, cover the whole tightly with a double linen rag, put one drop of oil on the surface, and rub the work with a circular motion. Should the rubber stick, it requires more polish. Previous to putting the French polish on the wadding pledget it ought to be mixed with the best drop black, in the proportion of  $\frac{1}{4}$  oz. of drop black to 1 gill of French polish. When the work has received one coat, set it aside to dry for about an hour. After the first coat is laid on, and thoroughly dry, it should be partly papered off with No. 0 paper. This brings the surface even, and at the same time fills up the grain. Now give a second coat, as before. Allow 24 hours to elapse, again smooth off and give a final coat as be-

### (Stains)

fore. Now comes spiriting off. Great care must be used here, or the work will be dull instead of bright. A clean rubber must be made, as previously described, but instead of being moistened with polish it must be wetted with 90% alcohol, placed in a linen rag screwed into a tight, even surface ball, just touched on the face with a drop of oil, and then rubbed lightly and quickly in circular sweeps all over the work, from top to bottom. One application of spirits is usually enough if sufficient has been placed on the rubber at the outset; but it is better to use rather too little than too much at a time, as an excess will entirely remove the polish, when the work will have to be polished again. Should this be the case, paper off at once, and commence as at first. It is the best way in the end.

2.—Lauher dissolves extract of logwood in boiling water until the solution indicates 0° Baumé; 5 pt. of the solution is then mixed with  $2\frac{1}{2}$  pt. of pyrolineous iron mordant of 10° and  $\frac{1}{2}$  pt. of acetic acid of 2°. The mixture is heated for  $\frac{1}{4}$  hour, and is then ready for use.

3.—To imitate black ebony, first wet the wood with a solution of logwood and copperas, boiled together, and laid on hot. For this purpose, 2 oz. of logwood chips, with  $1\frac{1}{2}$  oz. of copperas to 1 qt. of water will be required. When the work has become dry, wet the surface again with a mixture of vinegar and steel filings. This mixture may be made by dissolving 2 oz. of steel filings in  $\frac{1}{2}$  pt. of vinegar. When the work has become dry again, sandpaper down until quite smooth. Then oil, and fill in with powdered drop black mixed in the filler. Work to be ebonized should be smooth and free from holes, etc. The work may receive a light coat of quick-drying varnish, and then be rubbed with finely pulverized pumice and linseed oil until very smooth.

4.—Strong vinegar, 1 gal.; extract of logwood, 2 lb.; green copperas,  $\frac{1}{2}$  lb.; China blue,  $\frac{1}{4}$  lb.; nutgall, 2 oz. Put these in an iron pot, and boil them over a slow fire till they are well dissolved. When cool, the mixture is ready for use. Add to the above  $\frac{1}{2}$  pt. of iron rust, which may be obtained by scraping rusty hoops, or preferably by steeping iron filings in a solution of acetic acid or strong vinegar.

5.—For the fine black ebony stain, apple, pear and hazel woods are the best woods to use; when stained black they are most complete imitations of the natural ebony. For the stain, take gill apple,

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14 oz.; rasped logwood,  $3\frac{1}{2}$  oz.; vitriol,  $1\frac{3}{4}$  oz.; verdigris,  $1\frac{3}{4}$  oz. For the second coating a mixture of iron filings (pure),  $3\frac{1}{2}$  oz., dissolved in strong wine vinegar;  $1\frac{1}{2}$  pt. are warmed, and, when cool, the wood, already blackened, is coated 2 or 3 times with it, allowing it to dry after each coat. For articles which are to be thoroughly saturated, a mixture of  $1\frac{3}{4}$  oz. of sal ammoniac, with a sufficient quantity of steel filings, is to be placed in a suitable vessel, strong vinegar poured upon it, and left for 14 days in a gently heated oven. A strong lye is now put into a suitable pot, to which is added coarsely bruised gall apples and blue Brazil shavings, and exposed for the same time as the former to the gentle heat of an oven, which will then yield a good liquid. The woods are now laid in the first named stain, boiled for a few hours, and left in it for 3 days longer; they are then placed in the second stain, and treated as in the first. If the articles are not then thoroughly saturated they may be once more placed in the first bath, and then in the second. The polish used for wood that is stained black should be white (colorless) polish, to which a very little finely ground Prussian blue should be added.

6.—Manilla, 160 lb.; rosin, 20 lb.; castor oil,  $\frac{3}{4}$  lb.; methylated spirit, 25 gal.; wood spirit, 2 gal.; benzoin, 1 lb.; aniline black, 3 lb.; fusel oil,  $\frac{1}{2}$  gal.

7.—Methylated spirit, 5 gal.; garnet shellac, 8 lb.; dark rosin, 7 lb.; spirit of ebony, 10 oz.

8.—Spirit black, 3 oz., to 1 gal. of varnish base.

9.—Leave out dyes in oak stain, and add 4 lb. of black aniline.

*Gray.*—1.—Grays may be produced by boiling 17 oz. of orchil paste for  $\frac{1}{2}$  hour in 7 pt. of water. The wood is first treated with this solution, and then, before it is dry, steeped in a beek of iron nitrate at  $1^{\circ}$  B. An excess of iron gives a yellowish tone; otherwise, a blue gray is produced, which may be completely converted into blue by means of a little potash.

2.—Silver nitrate, 1 part, dissolved in distilled water, 50 parts; wash over twice, then with hydrochloric acid, and afterward with water of ammonia. The wood is allowed to dry in the dark, and then finished in oil, and polished.

*Green.*—1.—In order to secure diversity of shades, make two solutions, as follows, and mix in any proportion preferred, remembering that the indigo darkens the tint. The most generally used combina-

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tion will be 6 parts of (a) to 1 part of (b): (a) Verdigris, 4 oz.; vinegar, 40 oz. (b) Indigo, 4 dr.; vinegar, 20 oz. Both (a) and (b) will be better if boiled for 10 minutes during solution.

2.—Water, 27.5 kgm.; ground garnet shellac, 2.75 kgm.; ground borax, 1.38 kgm.; water-soluble green tar dyestuff, 0.37 kgm.

3.—Spirit sage green, 3 oz., to 1 gal. of varnish base.

4.—Bronze Green.—Methylated spirit, 5 gal.; garnet shellac, 8 lb.; black rosin, 7 lb.; fast yellow extra,  $2\frac{1}{4}$  oz.; fast green bluish, 1 oz.; orange, H. B., 80 gr.; azo-fuchsine, 40 gr.

5.—Dark Green.—Methylated spirit, 5 gal.; garnet shellac, 8 lb.; dark rosin, 7 lb.; acid green, G. G.,  $3\frac{1}{2}$  oz.; naphthol yellow, S., 13 $\frac{1}{2}$  oz.; fast acid violet, 10 lb.;  $\frac{1}{2}$  oz.; orange, H. B.,  $\frac{1}{2}$  dr.

6.—Olive Green.—Methylated spirit, 5 gal.; garnet shellac, 8 lb.; black rosin, 4 lb.; elemi, 3 lb.; fast yellow, extra, 3 oz.; fast green, bluish,  $5\frac{1}{2}$  dr.; orange, H. B., 70 gr.

7.—Verdant Green.—Methylated spirit, 5 gal.; orange shellac, 8 lb.; lemon rosin, 5 lb.; elemi, 2 lb.; naphthol yellow, S.,  $2\frac{1}{2}$  oz.; fast light green, 1 oz.

*Jacaranda or Violet Wood.*—1.—Immerse walnut, alder, cherry or beech in a hot decoction of Brazil wood and potash. Put in the black veins afterward by means of a brush charged with a solution of sulphate of iron.

2.—Soak pear, beech, ash, elm, alder, poplar or birch for 24 hours in a hot solution consisting of walnut shells, 5 parts; acetic acid, 1 part; water, 80 to 100 parts. Finally dry in the air.

*Mahogany Stain.*—1.—Water, 27.5 kgm.; ground orange shellac, 2.75 kgm.; ground borax, 1.38 kgm.; water-soluble tar dyestuff (mahogany red), 0.560 kgm.

2.—Methylated spirit, 5 gal.; orange shellac, 10 lb.; amber rosin, 5 lb.; spirit mahogany, 8 oz.

3.—Rub the wood with a solution of nitrous acid, and then apply with a brush the following: Dragon's blood, 1 oz.; sodium carbonate, 6 dr.; alcohol, 20 oz. Filter just before use.

4.—Rub the wood with a solution of potassium carbonate, 1 dr. to 1 pt. of water, and then apply a dye made by boiling together madder, 2 oz.; logwood chips,  $\frac{1}{2}$  oz.; water, 1 qt.

5.—Mordant the wood with dilute nitric acid, and apply the following: Alkanet,  $\frac{1}{2}$  oz.; aloes, 1 oz.; dragon's blood, 1 oz.; alcohol, 1 pt.

6.—Manilla, 160 lb.; rosin, 24 lb.; cas-

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tor oil,  $\frac{3}{4}$  lb.; methylated spirit, 25 gal.; wood spirit, 2 gal.; benzoin, 1 lb.; Bismarck brown, 2 lb.; black aniline,  $\frac{1}{4}$  lb.; fusel oil,  $\frac{1}{2}$  gal.

7.—Spirit mahogany, 3 oz., to 1 gal. of varnish base.

8.—Leave out dyes in oak stain and add Bismarck brown, 2 lb.; black aniline, 1 oz.

Oak.—1.—Methylated spirit, 5 gal.; garnet shellac, 8 lb.; dark rosin, 7 lb.; spirit of oak, 8 oz.

2.—Benzoin, 1 lb.; manilla, 144 lb.; rosin, 20 lb.; methylated spirit, 16 gal.; solvent naphtha (wood), 2 gal.; fusel oil,  $\frac{1}{2}$  gal.; yellow aniline, 10 oz.; black aniline, 3 oz.; castor oil,  $\frac{1}{2}$  lb.

3.—Mix powdered ochre, Venetian red and umber in size, in proportions to suit; or a richer stain may be made with raw sienna, burnt sienna and Vandyke. A light yellow stain of raw sienna alone is very effective.

4.—Darkening Oak.—Lay on liquid ammonia with a rag or brush. The color deepens immediately, and does not fade; this being an artificial production of the process which is induced naturally by age. Potash bichromate, dissolved in cold water, and applied in a like manner, will produce a very similar result.

5.—In Germany, the cabinetmakers use very strong coffee for darkening oak. To make it very dark: Iron filings with a little sulphuric acid and water, put on with a sponge, and allowed to dry between each application, until the right hue is reached.

6.—Whitewash with fresh lime, and, when dry, brush off the lime with a hard brush and dress well with linseed oil. It should be done after the wood has been worked, and it will make not only the wood, but the carving or molding, look old also.

7.—Use a strong solution of common washing soda, say 1 or 2 coats, until the proper color is obtained. Or you may try potash carbonate. Paper, and finish off with linseed oil.

8.—A decoction of green walnut shells will bring new oak to any shade, or nearly black.

9.—A good method of producing the peculiar olive brown of old oak is by fumigation with liquid ammonia; the method has many advantages beyond the expense of making a case or room airtight, and the price of the ammonia. It does not raise the grain, the work keeping as smooth as at first. Any tint, or, rather, depth of the color, can be given with certainty, and the darker shade of

### (Stains)

color will be found to have penetrated to the depth of a veneer, and much farther where the end grain is exposed, thus doing away with the chance of an accidental knock showing the white wood. The coloring is very even and pure, not destroying the transparency of the wood. It is advisable to make the furniture from one kind of stuff, not to mix English oak with Kiga, and so on. They both take the color well, but there is a kind of American red oak that does not answer well. In all cases care must be taken to have no glue or grease on the work, which would cause white spots to be left. The deal portions of the work are not affected in the least, neither does it affect the sap of oak. The best kind of polish for furniture treated in this manner is wax polish, or the kind known as eggshell polish. The process of fumigation is very simple. Get a large packing case, or, better still, make a room in a corner of the polishing shop, about 9 ft. long, 6 ft. high and 3 ft. 6 in. wide; paste paper over the joints; let the door close on to a strip of india-rubber tubing; put a pane of glass in the side of the box or house to enable you to examine the progress of coloring. In putting in your work, see that it does not touch anything to hinder the free course of the fumes. Put 2 or 3 dishes on the floor to hold the ammonia; about  $\frac{1}{2}$  pt. is sufficient for a case this size. The ammonia differs in purity, some leaving more residue than others. Small articles can be done by simply covering them with a cloth, having a little spirits in a pot underneath. A good useful color can be given by leaving the things exposed to the fumes overnight. The color lightens on being polished, owing to the transparency thus given to the wood.

10.—Manilla gum, 84 lb.; dark rosin, 84 lb.; yellow aniline, 9 oz.; Bismarck brown, 7 oz.; aniline black, 3 oz.; methylated spirit, 17 gal.; petroleum, 4 gal.

11.—Spirit of oak, 3 oz. to 1 gal. of varnish base.

12.—Orange Yellow Tone to Oak Wood.—According to Niedling, a beautiful orange yellow tone, much admired in a chest at the Vienna Exhibition, may be imparted to oak wood by rubbing it in a warm room with a certain mixture until it acquires a dull polish, and then coating it, after an hour, with thin polish, and repeating the coating of polish to improve the depth and brilliancy of the tone. The ingredients for the rubbing mixture are about 3 oz. of tallow,  $\frac{1}{4}$  oz. of wax and

## Paints, Varnishes, Etc.

### (Stains)

1 pt. of oil of turpentine, mixed by heating together and stirring.

13.—Nitric acid (aqua fortis), 0.5 oz., is compounded with 1.57 oz. of rain water, and the article to be stained is brushed over with this. Undiluted nitric acid gives a brownish yellow color.

14.—Digest 2.1 oz. of finely powdered turmeric for several days in 17.5 oz. of alcohol, 80% strong, and then strain through a cloth. This solution is applied to the articles to be stained. When they have become entirely dry they are burnished and varnished.

**Orange Stain.**—Yellow or orange stains generally result from the use of nitric acid or turmeric. Thus, 2.1 oz. of finely powdered turmeric are digested for several days in 17.5 oz. of 80% alcohol, and then strained through a cloth. This solution is applied to the articles to be stained. Nitric acid, diluted with 3 parts of water, is likewise used. A hot concentrated solution of picric acid can likewise be used.

**Purple.**—1.—Logwood chips, 1 lb.; water, 3 gal.; pearlsh, 4 oz.; powdered indigo, 2 oz. Boil the logwood in the water till the full strength is obtained, then add the pearlsh and indigo, and when the ingredients are dissolved the mixture is ready for use, either warm or cold. This gives a beautiful purple.

2.—To stain wood a rich purple or chocolate color, boil  $\frac{1}{2}$  lb. of madder and  $\frac{1}{4}$  lb. of fustic in 1 gal. of water, and when boiling brush over the work until stained. If the surface of the work should be perfectly smooth, brush over with a weak solution of nitric acid; then finish with the following: Put  $4\frac{1}{2}$  oz. of dragon's blood and 1 oz. of soda, both well bruised, into 3 pt. of 90% alcohol. Let it stand in a warm place, shake frequently, strain, and lay on with a soft brush, repeating until a proper color is gained. Polish with linseed oil or varnish.

**Red.**—1.—The wood is plunged first in a solution of 1 oz. of curd soap in 35 fl. oz. of water, or else is rubbed with the solution, then magenta is applied in a state of sufficient dilution to bring out the tone required. All the aniline colors behave very well on wood.

2.—Red Stain for Bedsteads and Common Chairs.—Archil will produce a very good stain of itself when used cold; but if, after one or two coats being applied, and suffered to become almost dry, it is brushed over with a hot solution of pearlsh in water, it will improve the color.

**Rosewood.**—1.—Spirit of rosewood, P., 2 oz. to 1 gal. of varnish; or spirit of

### (Stains)

rosewood, R. S., 2 oz. to 1 gal. of varnish base.

2.—Leave out dyes in oak stain, and add mahogany, 3 gal.; walnut, 1 gal.

3.—Blend mahogany, 3 gal.; walnut, 1 gal.; or to above gums and spirit use 3 lb. of rosewood stain.

4.—Methylated spirit, 5 gal.; garnet shellac, 10 lb.; lemon rosin, 5 lb.; Bismarck brown, 4 oz.; spirit of walnut, 4 oz.

5.—Boil  $1\frac{1}{2}$  lb. of logwood chips in 1 gal. of water until the volume of the infusion is reduced to 2 qt. Apply this boiling hot. If more than one application is necessary, the wood should be allowed to dry before a fresh brushing over is done. The finished surface must be grained with a camel's-hair pencil dipped in logwood infusion containing the sulphates of iron and copper.

**Satin Wood Stain.**—1.—Water, 27.5 kgm.; ground bleached shellac, 2.75 kgm.; ground borax, 1.38 kgm.; water-soluble tar dyestuff (satin yellow), 0.465 kgm.

2.—Methylated spirit, 5 gal.; bleached shellac, 7 lb.; amber rosin, 5 lb.

3.—Leave out dyes in oak stain, and add yellow aniline, 9 oz.

4.—Satinwood, Pine and Maple.—Spirit of satinwood, extra, 2 to 4 oz. to 1 gal. of varnish base.

**Violet.**—1.—Methylated spirit, 5 gal.; garnet shellac, 8 lb.; black rosin, 5 lb.; elemi, 2 lb.; fast acid violet, 10 B.,  $2\frac{1}{4}$  oz.; azo-fuchsine, G.,  $1\frac{1}{4}$  oz.; acid violet, 4 B. extra,  $1\frac{1}{4}$  oz.

2.—Dye the wood with aniline red and tin salt, after a previous treatment with 1 part of calcined soda, 3 parts of olive oil and 15 parts of hot water.

3.—The wood is treated in a bath made up with  $4\frac{1}{2}$  oz. of olive oil, the same weight of soda ash and  $2\frac{1}{2}$  pt. of boiling water, and it is then dyed with magenta, to which a corresponding quantity of tin crystals have been added.

**Walnut.**—1.—Methylated spirit, 5 gal.; garnet shellac, 8 lb.; dark rosin, 7 lb.; spirit of walnut, 8 oz.

2.—Benzoin, 1 lb.; manilla, 144 lb.; rosin, 20 lb.; methylated spirit, 25 lb.; solvent naphtha (wood), 2 gal.; fusel oil,  $\frac{1}{2}$  gal.; Bismarck brown, 15 oz.; aniline black, 7 oz.; castor oil,  $\frac{1}{2}$  lb. The castor oil gives elasticity.

3.—Water, 22.5 kgm.; ground garnet shellac, 2.25 kgm.; ground borax, 1.13 kgm.; water-soluble tar dyestuff (walnut color), 0.466 kgm.

4.—Strong vinegar, 1 gal.; dry burnt umber, 1 lb.; fine rose pink,  $\frac{1}{2}$  lb.; dry burnt Vandyke brown,  $\frac{1}{2}$  lb. After mix-

## Paints, Varnishes, Etc.

### (Varnishes)

ing, and standing for a day, it is ready for use. Apply with a sponge.

5.—This varnish is for rapidly coloring and varnishing soft or hard white woods simultaneously, so as to imitate the real wood: Methylated spirit, 160 fl.oz.; walnut spirit stain, 3 oz.; amber rosin, powdered, 24 oz.; shellac, 24 oz. Digest in the sand bath.

6.—Spirit of walnut, 3 oz., to 1 gal. of varnish base.

7.—Leave out dyes in oak stain and add: Bismarck brown, 14 oz.; Japan black aniline, 6 oz.

8.—Black Walnut.—A decoction of green walnut husks, dried, and boiled in lyc. is recommended.

9.—Dragon's blood and lampblack, mixed in wood alcohol, may be used, well rubbed into the wood.

10.—Take 1 lb. of logwood chips, 1/2 lb. of red sanders, 1/2 gal. of water. Boil over a fire until the full strength is obtained. Apply the mixture, while hot, to the wood with a brush. Use 1 or 2 coats to obtain a strong red color. Then take 1 gal. of spirits of turpentine and 2 lb. of asphaltum. Dissolve in an iron kettle on a stove, stirring constantly. Apply over the red stain with a brush, to imitate rosewood. To make a perfect black, add a little lampblack. The addition of a small quantity of varnish with the turpentine will improve it. This stain, applied to birch wood, gives as good an imitation of rosewood as on black walnut, the shade on the birch being a little brighter.

*Yellow*.—1.—Mordant with red liquor, and dye with bark liquor and turmeric.

2.—Turmeric dissolved in wood naphtha.

3.—Aqua regia (nitro muriatic acid), diluted in 3 parts of water, is a much used, though rather destructive, yellow stain.

4.—Nitric acid gives a fine permanent yellow, which is converted into dark brown by subsequent application of tincture of iodine.

5.—Wash over with a hot concentrated solution of picric acid, and, when dry, polish the wood.

### VARNISHES

#### What Varnishes Are Made of.

Varnish is a solution of resinous matter forming a clear, limpid fluid, capable of hardening without losing its transparency. It is used to give a shining, transparent, hard and preservative covering to the finished surface of woodwork, capable

### (Varnishes)

of resisting in a greater or less degree the influence of the air and moisture. This coating, when applied to metal or mineral surfaces, takes the name of lacquer, and must be prepared from rosins at once more adhesive and tenacious than those entering into varnish.

The rosins, commonly called gums, appropriate to varnish are of two kinds—the hard and the soft. The hard varieties are copal, amber and the lac rosins. The dry, soft rosins are juniper gum (commonly called sandarac), mastic and dammar. The elastic soft rosins are benzoin, elemi, anime and turpentine. The science of preparing varnish consists in combining these classes of rosins in a suitable solvent, so that each conveys its good qualities and counteracts the bad ones of the others, and in giving the desired color to this solution without affecting the suspension of the rosins, or detracting from the drying and hardening properties of the varnish.

*Spirit vs. Oil Varnishes*.—In spirit varnish (that made with alcohol) the hard and the elastic gums must be mixed to insure tenderness and solidity, as the alcohol evaporates at once after applying, leaving the varnish wholly dependent on the gums for the tenacious and adhesive properties; and if the soft rosins predominate, the varnish will remain "tacky" for a long time. Spirit varnish, however good and convenient to work with, must always be inferior to oil varnish, as the latter is at the same time more tender and more solid, for the oil, in oxidizing and evaporating, thickens, and forms rosin, which continues its softening and binding presence, whereas in a spirit varnish the alcohol is promptly dissipated, and leaves the gums on the surface of the work in a more or less granular and brittle precipitate, which chips readily and peels off.

Varnish must be tender, and, in a manner, soft. It must yield to the movements of the wood in expanding or contracting with the heat or cold, and must not inclose the wood like a sheet of glass. This is why oil varnish is superior to spirit varnish. To obtain this suppleness the gums must be dissolved in some liquid not highly volatile like spirit, but one which mixes with them in substance permanently to counteract their extreme friability. Such solvents are the oils of lavender, spike, rosemary and turpentine, combined with linseed oil. The vehicle in which the rosins are dissolved must be and remain soft, so as to keep soft the rosins which are, of themselves, naturally hard.

## Paints, Varnishes, Etc.

### (Varnishes)

Any varnish from which the solvent has been completely dried out must, of necessity, become hard and glassy, and chip off. But, on the other hand, if the varnish remains too soft and "tacky," it will "cake" in time, and destroy the effect desired.

In estimating the quality of a varnish the following points must be considered: 1, quickness in drying; 2, hardness of film or coating; 3, toughness of film; 4, amount of gloss; 5, permanence of gloss of film; 6, durability on exposure to weather.

**Ingredients.**—Driers are generally added to varnish in the form of litharge, sugar of lead, or white copperas. Sugar of lead not only hardens, but combines with the varnish. A large proportion of driers injures the durability of the varnish, though it causes it to dry more quickly.

1.—For Body and Luster.—Amber, anime, copal, elemi, lac, mastic, sandarac.

2.—For Color.—Benzoin.

3.—For Tinctorial Effect.—a.—Coloring matters soluble in water and alcohol: Magenta, cardinal, erythrosine, safranin, methylene blue, picric acid, curcumin, metanil yellow, Hoffmann violet, malachite green, Bismarck brown, acid magenta, cerise, rose bengal, cocine, peacock blue, naphthol yellow, brilliant yellow, methyl orange, regina purple, brilliant green, ye-suvine, rubin, methyl eosine, phloxine, navy blue, phosphine, auramine, chrysoidine, methyl violet, acid mauve, iodine green, crimson, eosine, coralline, benzyl blue, aurantia, chrysophenine, mandarin, acid violet, methyl green.

b.—Coloring matters soluble in water only: Congo, congo corinth, brilliant congo, benzopurpurine, delta purpurine, roseazurine, Hessian purple, fast red, archil red, ponceau, scarlet, azo-rubine, heliotrope, brilliant blue, wool blue, black blue, benzazurine, azo-blue, Guernsey blue, Hessian blue, water blue, Bavarian blue, Capri blue, alkali blue, China blue, regina violet, azo-violet, fast brown, acid brown, resorcin brown, guinea green, aniline gray, nigrosine, silver gray, wool black, naccarat, brilliant scarlet, acid yellow, resorcin yellow, quinoline yellow, azo-acid yellow, naphthol yellow, chrysamine, Hessian yellow, curcumin, orange, methyl orange, rusin S.

c.—Coloring matters soluble in alcohol only: Rosaniline base, nigrosine spirit (soluble), Humboldt blue, aurine, malachite green base, new violet, Soudan, brilliant black, auramine base, spirit blue, induline spirit (soluble).

### (Varnishes)

d.—Colors soluble in oil: Rosaniline base, magenta base, oil yellow, butter yellow, violet base, auramine base, oil violet, oil brown, Soudan 1, picric acid, oil orange, oil scarlet, Soudan 11, oil green, oil crimson.

Practically none of the coal-tar colors are soluble in petroleum spirit, turpentine or benzol. While, therefore, the coal-tar colors are available for coloring water—and spirit—varnishes, but few of them are useful for coloring oil varnishes, and none for coloring varnishes made from turpentine, petroleum spirit, or benzol.

4.—For Color and Body.—Asphaltum.

5.—For Toughness and Elasticity.—Caoutchouc.

**Manufacturing Hints.**—Glass, coarsely powdered, is often added to varnish when mixed in large quantities, for the purpose of cutting the rosins and preventing them from adhering to the bottom and sides of the container. When possible, varnish should always be compounded without the use of heat, as this carbonizes and otherwise changes the constituents, and, besides, danger always ensues from the highly inflammable nature of the material employed. However, when heat is necessary, a water bath should always be used; the varnish should never fill the vessel over a half to three-quarters of its capacity.

The Gums Used in Making Varnish.—Juniper gum, or true sandarac, comes in long, yellowish, dusty tears, and requires a high temperature for its manipulation in oil. The oil must be so hot as to scorch a feather dipped into it, before this gum is added; otherwise, the gum is burnt. Because of this, juniper gum is usually displaced in oil varnish by gum dammar. Both of these gums, by their dryness, counteract the elasticity of oil as well as other gums. The usual sandarac of commerce is a brittle, yellow, transparent resin from Africa, more soluble in turpentine than in alcohol. Its excess renders varnish hard and brittle. Commercial sandarac is also often a mixture of the African resin with dammar or hard Indian copal, the place of the African resin being sometimes taken by the true juniper gum. This mixture is the pounce of the shops, and is almost insoluble in alcohol or turpentine. Dammar also largely takes the place of tender copal, gum guaiac, white amber, white incense and white resin. The latter three names are also often applied to a mixture of oil and Grecian wax, sometimes used in varnish. When gum dammar is used



## Paints, Varnishes, Etc.

### (Varnishes, Aniline)

as the main rosin in a varnish it should be first fused and brought to a boiling point, but not thawed. This eliminates the property that renders dammar varnish soft and "tacky," if not treated as above. Venetian turpentine has a tendency to render varnish "tacky," and must be skilfully counteracted if this effect is to be avoided. Benzoin in varnish exposed to any degree of dampness has a tendency to swell, and must, in such cases, be avoided. Elemi, a fragrant rosin from Egypt, in time grows hard and brittle, and is not so soluble in alcohol as anime, which is highly esteemed for its more tender qualities. Copal is a name given rather indiscriminately to various gums and rosins. The East Indian or African is the tender copal, and is softer and more transparent than the other varieties; when pure, it is freely soluble in oil of turpentine or rosemary. Hard copal comes in its best form from Mexico, and is not readily soluble in oil unless first fused. The brilliant, deep-red color of old varnish is said to be based on dragon's blood, but not the kind that comes in sticks, cones, etc. (which is always adulterated), but the clear, pure tear, deeper in color than a carbuncle, and as crystal fiery as a ruby. This is seldom seen in the market, as is also the tear of gamboge, which, mixed with the tear of dragon's blood, is said to be the basis of the brilliant orange and gold varnish of the ancients.

#### Amber Varnish.

Amber varnish is suited for all purposes, where a very hard and durable oil varnish is required. The paler kind is superior to copal varnish, and is often mixed with the latter to increase its hardness and durability.

1.—Hard.—Melted amber, 4 oz.; hot, boiled oil, 1 qt.

2.—Pale.—Very pale and transparent amber, 4 oz.; clarified linseed oil and oil of turpentine, of each 1 pt.

3.—Amber and Elemi Lacquer.—Amber, 4 parts; elemi, 1 part; Venice turpentine, 1 part; oil of turpentine, 12 parts. This makes a very beautiful and lasting lacquer.

#### Aniline Varnishes.

1.—These are very useful, as the color is intense, even when in a very thin film. Use alcohol to dissolve the shellac or sandarac. Prepare also an alcoholic solution of the aniline colors; add this to the varnish. Warm the object slightly.

2.—Collodion can also be used to carry

### (Varnish, Balloon)

the aniline colors, and gives a very thin coating.

#### Asphalt Varnish.

1.—Boil coal tar until it shows a disposition to harden on cooling; this can be ascertained by rubbing a little on a piece of metal. Then add about 20% of lump asphalt, stirring it with the boiling coal tar until all the lumps are melted, when it can be allowed to cool and kept for use. This makes a very bright varnish for sheet metals, and is cheap and durable.

2.—*Asphalt Varnish for Metals.*—Boil ordinary tar until on cooling it shows a tendency to harden, add about 1-5 asphaltum, shaved fine, until all is melted; then cool.

#### Balloon Varnish.

Carl E. Myers, the aeronaut, gives the following exclusive information, which is copyright, 1908, by Munn & Co.:

1.—The matter of balloon varnish seems to be giving a lot of trouble. It always has, more or less, as commercial varnish manufacturers do not make balloon varnishes, and none of the ordinary varnishes serve well for balloons. What is wanted is an elastic, non-adhesive and enduring varnish, that will not heat or spontaneously decompose. Pure boiled linseed oil comes the nearest to these requirements. The difficulty is in getting it pure, to begin with, and keeping it unmixed with oxides or dryers when boiled. Any such admixtures lay the seeds of destruction, for oxidizing, if once started, is kept up continuously till the mass is rusted or rotted finally, and the fabric made brittle or sticky, and soon useless. Balloon varnish is not a matter of formula or recipe, but a process or system of preparation, and thus requires experience, judgment, and, to some extent, courage, as it is more or less dangerous to produce good linseed-oil varnish cooked at a high temperature. I have known one large varnish factory to be entirely destroyed in attempting to make balloon varnish, and I have seen over a hundred conflagrations of more or less magnitude result from boiling oil to make balloon varnish. I only make balloon varnish once a year, in considerable quantities, requiring weeks with special apparatus, on a manufacturing scale, and I aim to keep a year's supply on hand, and use the oldest and best. My varnishing is done by patent machinery, permitting the use of pure linseed-oil varnish too thick to spread by hand brushes. One thousand yards of surface

## Paints, Varnishes, Etc.

### (Varnish, Balloon)

require about an hour's work, all superficial varnish being removed by the machines, after which the fabric is dried spontaneously in the hot sun, without oxidizing driers. This process is repeated several times till 7 to 9 films are superimposed, with increased thickness, appreciable by a micrometer caliper after the first coat is applied. The microscopic pores in each film do not coincide, or are plugged up, resulting in a practically hydrogen-proof fabric, of light weight and thickness, which can be folded or rolled repeatedly without fracture of the films at ordinary temperatures, and which never decomposes or sticks or becomes rotten when packed. I have tried very many preparations, and found them mostly unsuitable for continued usefulness. The best of these include good boiled linseed oil as a basis, thinned with best spirits of turpentine or stove gasolene, for use with hand brushes. Driers to be used are chiefly litharge or "japan" and chrome yellow. "Birdlime" and rubber are sometimes mixed in small quantities with linseed-oil varnish, and are of doubtful value. Raw or half-boiled linseed oil will never make other than a sticky coat, necessitating frequent dusting with talc, chalk, or other similar preparations, and will inevitably ruin any balloon coated with it. While almost any varnish, in repeated layers, will serve to hold gas temporarily, or for immediate use, on a balloon, such vessels are short-lived, heavier than desirable, and not satisfactory for airships or vessels required to hold hydrogen for a long time.

2.—Good boiled linseed oil, if allowed a sufficient time to dry and harden, forms an excellent varnish for balloon cases.

3.—India-rubber, 1 lb., cut small; oil of turpentine, 6 lb.; boiled drying oil, 1 gal. Digest the india-rubber in the turpentine, in a warm place, for a week, frequently shaking the vessel during the whole time, then place it in a water bath and gradually heat it until the solution is completed; next add the oil, previously made warm, gently simmer for 5 minutes, stirring all the while, after which closely cover it over, and when cold strain it through flannel.

4.—Birdlime, 1 lb.; boiled linseed oil, 3 pt.; turpentine, q. s. Boil the birdlime with 1 pt. of the oil, in an iron pot, over a slow fire, for about half an hour, or until the former ceases to crackle; then add the rest of the oil, previously heated, and again boil for one hour, stirring well all the time, being careful that it does not boil over, as it is very liable to do

### (Varnish, Black)

so. When it has boiled sufficiently may be known by its admitting of being drawn into threads between two knives. As soon as this occurs remove the pot from the fire, and when cooled a little add a sufficient quantity of spirits of turpentine, warm, to reduce it to a proper consistency, and work it well up. These varnishes are better applied lukewarm to the silk, previously stretched out tight. In about 24 hours they will dry.

#### Bamboos, Varnish for.

A varnish prepared by dissolving 3 oz. of white shellac in 10 fl.oz. of methylated spirits, applied to the bamboo with a camel's-hair brush, will give a beautiful transparent coating, while showing the natural color of the wood.

#### Basket Varnish.

Orange shellac, 8 oz.; yellow rosin, 1 oz.; benzoin,  $\frac{1}{2}$  oz.; Bismarck brown,  $\frac{1}{4}$  oz.; methylated spirit,  $1\frac{1}{2}$  pt.; vegetable naphtha,  $\frac{1}{2}$  pt.

*Wicker Baskets, Varnish for.*—1.—Brown.—Orange shellac, 28 lb.; powdered manila copal, 28 lb.; powdered common rosin, 56 lb.; methylated spirit, 12 gal.

2.—White.—Powdered pale manila copal, 56 lb.; powdered pale rosin, 112 lb.; methylated spirit, 16 gal. (See also *Wicker Wagon Bodies.*)

#### Black Varnish.

1.—Shellac, 8 parts; rosin, 5 parts; lampblack, 1 part; alcohol, 94%, 32 parts. If a dead black be required, use the same proportion of ingredients, with oil of turpentine as the solvent.

2.—In an iron pot, over a slow fire, boil 45 lb. of foreign asphaltum for at least 6 hours, and during the same time boil in another iron pot 6 gal. of oil which has been previously boiled; during the boiling of the 6 gal. introduce 6 lb. of litharge gradually, and boil until it feels stringy between the fingers; then ladle it into the pot containing the boiling asphaltum. Let both boil until, upon trial, it will roll into hard pills; then cool, and mix with 25 gal. of turpentine, or until it is of a proper consistency.

3.—Black varnish suitable for covering places where a japanned surface has been injured or scratched: Fine lampblack or ivory black, thoroughly mixed with copal varnish. The black must be in fine powder, and it would mix the more readily if made into a pasty mass with turpentine.

4.—Black varnish can be made by putting 48 lb. of foreign asphaltum into an

## Paints, Varnishes, Etc.

### (Varnish, Bookbinders')

iron pot and boiling for 4 hours; during the first 2 hours introduce 7 lb. of red lead, 7 lb. of litharge, 3 lb. of dried copperas and 10 gal. of boiled oil; add one 8-lb. run of dark gum with 2 gal. of hot oil. After pouring the oil and gum continue the boiling 2 hours, or until it will roll into hard pills like japan. When cool, thin it off with 30 gal. of turpentine, or until it is of proper consistency. This varnish is specially adapted for iron-work.

5.—*Black Amber Varnish*.—Amber, 1 lb.; fuse, add hot drying oil,  $\frac{1}{2}$  pt.; powdered black rosin and asphaltum (Naples), of each 3 oz.; when properly incorporated, and considerably cooled, add oil of turpentine, 1 pt. This is the beautiful black varnish of the coachmakers. It is also fit for metals.

6.—*Brunswick Black*.—Black pitch and gas tar asphaltum, 25 lb. of each; boil gently for 5 hours, then add 8 gal. of linseed oil; litharge and red lead, 10 lb. of each; boil, and when cooled a little, thin with 20 gal. of oil of turpentine.

### Body Varnish.

1.—Finest African copal, 8 lb.; fuse carefully, add clarified oil, 2 gal.; boil gently for  $4\frac{1}{2}$  hours, or till quite stringy, cool a little, and thin with oil of turpentine,  $3\frac{1}{2}$  gal. Dries slowly.

2.—Pale gum copal, 8 lb.; clarified oil, 2 gal.; dried sugar of lead,  $\frac{1}{2}$  lb.; boil as before, then add oil of turpentine,  $3\frac{1}{2}$  gal., and mix it, while still hot, with the following varnish: Pale gum anime, 8 lb.; linseed oil, 2 gal.; dried white copperas,  $\frac{1}{4}$  lb.; boil as before, and thin with oil of turpentine,  $3\frac{1}{2}$  gal.; the mixed varnishes are to be immediately strained into the cans or cisterns.

### Bookbinders' Varnish.

1.—Venice turpentine, 12 kgm.; blond shellac, 30 kgm.; dissolved in spirit, 90 kgm.

2.—Pale gum sandarac, 3 oz.; alcohol, 20 fl.oz.; dissolve by cold digestion and frequent agitation.

3.—Dissolve pale shellac in wood naphtha.

4.—Mastic, 6 oz., in drops; coarsely pounded glass, 3 oz., separated from the dust by a sieve; 90% alcohol, 32 oz. Place the ingredients in a sand bath, over a fire, and let them boil, stirring them well. When thoroughly mixed, introduce 3 oz. of spirits of turpentine, boil for half an hour, remove from the fire, cool, strain through cotton cloth.

5.—Alcohol, 90%, 3 pt.; sandarac, 8

### (Varnish, Cabinet)

oz.; mastic, in drops, 2 oz.; shellac, 8 oz.; Venice turpentine, 2 oz. Prepare as for No. 1. Apply lightly on the book with a piece of cotton wool, a small sponge or a brush.

### Bottle Caps, Varnish for.

Gamboge, 2 parts; ruby red shellac, 2 parts; Venice turpentine, 1 part; strong alcohol, 20 parts.

### Bottles, Stoppers for.

Varnish bottles are best closed with stoppers formed of good and pure wax, or corks may be used which have previously been dipped in molten wax. If corks are employed with no wax coating, they very often stick fast in the bottles, and particles are often removed which render the varnish impure.

### Brass.

1.—Boil in alcohol, turmeric, 24 parts; saffron, 5 parts. This is filtered and heated in a water bath, in this tincture: Gamboge, 24 parts; elemi, 90 parts; dragon's blood, 30 parts; alcohol, 500 parts.

2.—*Black Letters for Brass Signs*.—A formula for a black japan adapted to the purpose is as follows: Asphaltum, 8 oz.; dark gum anime,  $\frac{1}{2}$  oz.; linseed oil, 18 oz.; dark gum amber,  $1\frac{1}{2}$  oz.; turpentine spirit,  $2\frac{1}{2}$  pt. Fuse together the asphaltum and gum anime, and add 15 oz. of the linseed oil. Boil the amber, previously fused with 3 oz. of the linseed oil, and add to the mixture. Continue the boiling until a little of the mass, when cooled, is plastic; then withdraw the heat and add the turpentine. The enamel process is altogether different, and consists in fusing on the brass a kind of glass, which, when cool, adheres to the metal. The preparation of the enamel involves special skill, and its application is also a matter not likely to be within the reach of the amateur.

### Brush Polish.

Garnet polish,  $\frac{1}{2}$  gal.; best brown, hard,  $\frac{1}{2}$  gal.; glaze,  $\frac{1}{2}$  pt. To make up if wanted in a hurry, or otherwise.

### Cabinet Varnish.

1.—Fuse 7 lb. of very fine African gum copal, and pour in  $\frac{1}{2}$  gal. of pale clarified oil.

2.—Sandarac rosin, 8 lb.; boiled oil, 4 lb. Boil until the mass is stringy, and then thin with 12 lb. of turpentine.

## Paints, Varnishes, Etc.

### (Varnish, Celluloid)

#### Cards. (See Playing Cards.)

#### Carriage Varnish. (See also Coaches.)

1.—*Best Pale*.—Second sorted African copal, 8 lb.; clarified oil,  $2\frac{1}{2}$  gal.; boil till very stringy. Dried copperas,  $\frac{1}{4}$  lb.; litharge,  $\frac{1}{4}$  lb.; turpentine,  $5\frac{1}{2}$  gal.; strained. Second sorted gum anime, 8 lb.; clarified oil,  $2\frac{1}{2}$  gal.; dried sugar of lead,  $\frac{1}{4}$  lb.; litharge,  $\frac{1}{4}$  lb.; turpentine,  $5\frac{1}{2}$  gal.; mix with the first while hot. If well boiled, this varnish will dry hard in 4 hours in summer and 6 hours in winter. As its name denotes, this is intended for the varnishing of the wheels, springs and carriage parts of coaches, chaises, etc.; also it is that description of varnish which is generally sold to and used by house painters and decorators, as from its drying quality and strong gloss it suits their general purposes well.

2.—*Quick-Drying Carriage Varnish*.—Fine pale gum anime, 8 lb.; clarified oil, 2 gal.; turpentine,  $3\frac{1}{2}$  gal.; to be boiled 4 hours. This, after being strained, is put into the two former pots, and well mixed together; its effect is to cause the whole to dry quicker and firmer, and enable it to take the polish much sooner. (See also Wicker Wagon Bodies.)

#### Caseine Varnish.

According to Amundsen, this is prepared as follows: Caseine, 100 parts; 10% solution of soap, 10 to 25 parts; slaked lime, 20 to 25 parts; oil of turpentine, 25 to 40 parts; water, sufficient. Mix the caseine with the soap solution; add the lime, and rub up to a homogeneous mixture. Now add the turpentine gradually, and with constant stirring. Add water to attain the desired consistency. The addition of a little ammonia water tends to aid this preparation in keeping. This is a very cheap and excellent varnish.

#### Celluloid Varnishes.

1.—Celluloid, 5 parts; sulphuric ether, 16 parts; acetone, 16 parts; amyl acetate, 16 parts. Mix and dissolve.

2.—Celluloid, 10 parts; camphor, 4 parts; sulphuric ether, 30 parts; acetone, 30 parts; amyl acetate, 30 gr. Mix and dissolve.

3.—Celluloid, 5 parts; camphor, 5 parts; alcohol, 50 parts. Mix and dissolve.

4.—Celluloid, 5 parts; amyl acetate, 5 parts. Mix.

5.—Celluloid, 5 parts; acetone, 25 parts; amyl acetate, 25 parts. Mix and

### (Varnish, Collodion)

dissolve. The ingredients of the above five formulas are inflammable.

#### Chimneys and Stove Pipes, Varnish for.

Asphaltum, 2 lb.; boiled linseed oil, 1 pt.; oil of turpentine, 2 qt. Fuse the asphaltum in an iron pot, boil the linseed oil, and add while hot. Stir well, and remove from the fire. When partially cooled add the oil of turpentine.

#### Coaches, Black Varnish for.

Asphaltum,  $7\frac{1}{2}$  oz.; amber, 40 oz.; rosin,  $7\frac{1}{2}$  oz.; drying linseed oil,  $1\frac{1}{4}$  pt. Melt together in an iron pot. When partially cool add warm oil of turpentine,  $1\frac{1}{4}$  pt.

#### Coal Buckets, Black Varnish for.

Asphaltum,  $1\frac{1}{2}$  lb.; lampblack,  $\frac{3}{4}$  lb.; rosin,  $\frac{3}{4}$  lb.; spirits of turpentine,  $1\frac{1}{2}$  qt. Dissolve the rosin and asphaltum in the turpentine; form a paste with the lampblack and linseed oil, q. s.; mix with the other. Apply with a brush.

#### Coffin Varnish.

1.—Take 60 kgm. of American rosin and dissolve it, together with 20 kgm. of manilla copal and 10 kgm. of gallipot, in 80 kgm. of spirit.

2.—*Coffin Polish*.—a.—Powdered manilla copal, 42 lb.; orange shellac, 14 lb.; powdered pale rosin, 70 lb.; methylated spirit, 15 gal.

b.—Garnet lac, 3 lb.; methylated spirit, 1 gal.

#### Collodion.

1.—Add 1 oz. of castor oil to 1 qt. of collodion. This is a very useful varnish for varnishing maps, etc.

2.—Hale's formula is as follows: Amyl acetate, 4 gal.; benzine (coal naphtha), 4 gal.; acetone, 2 gal.; pyroxyline,  $2\frac{1}{2}$  lb. The different ingredients are mixed and the pyroxyline dissolved therein. The metal article, having its surface polished and made free from water and grease by any ordinary or suitable means, is, or may be, dipped into a solution made according to either of the formulae, and on removal therefrom suspended in a chamber out of the draught till the adhering coat or film dries or hardens, which takes place in about 15 or 20 minutes. The drying may be hastened by artificial heat, and while the use of the heat at any stage of the process is not inconsistent with the invention, yet it is preferred to operate in the cold—that is, at ordinary temperatures. In damp weather the coating should be dried at a temperature of say,

## Paints, Varnishes, Etc.

### (Varnish, Copal)

100 to 105° F. The varnish or solution may also be applied by brushing. The coated articles, when the coatings are dry, have their metal surfaces provided with a substantial, even, hard, thin, smooth, impervious and transparent film of pyroxyline of sufficient tenacity, adhesion and durability practically to resist the handling and exposure to which lacquered articles in general are subjected.

#### Copal Varnish.

1.—*Turpentine*.—Oil of turpentine, 1 pt.; set the bottle in a water bath, and add, in small portions at a time, 3 oz. of powdered copal that has been previously melted by a gentle heat, and dropped into water; in a few days decant the clear. Dries slowly, but is very pale and durable. Used for pictures, etc.

2.—*Oil*.—Pale and hard copal, 2 lb.; fuse, add hot drying oil, 1 pt.; boil as before directed, and thin with oil of turpentine, 3 pt., 12 oz.; or q. s.

3.—*Clearer and palest African copal*, 8 lb.; fuse, add hot and pale drying oil, 2 gal.; boil till it strings strongly, cool a little, and thin with hot rectified oil of turpentine, 3 gal., and immediately strain into the store can. Very fine. Both the above are used for pictures.

4.—*Spirit*.—Coarsely powdered copal and glass, of each 4 oz.; 90% alcohol, 1 pt.; camphor,  $\frac{1}{2}$  oz.; heat it in a water bath, so that the bubbles may be counted as they rise, observing frequently to stir the mixture; when cold decant the clear. Used for pictures.

5.—*Copal Varnish with Ammonia*.—Grind copal to a coarse powder, and pour ammonia over it until the whole mass is swelled up. Heat this to about 100° F., then add alcohol until the mixture is of the desired consistency.

6.—*Best Body Copal Varnish for Coach Makers*.—Fuse 8 lb. of fine African gum copal; add 2 gal. of clarified oil; boil very slowly for 4 or 5 hours, until quite stringy; mix it with  $3\frac{1}{2}$  gal. of turpentine; strain off, and pour it into a cistern.

7.—*Camphorated Copal Varnish*.—Take powdered copal, 4 oz.; essential oil of lavender, 12 oz.; camphor,  $\frac{1}{4}$  oz.; and as much spirit of turpentine as will produce the required consistency. Heat the oil and the camphor in a small matrass, stirring them, and putting in the copal and turpentine in the same manner as for gold-colored copal varnish.

8.—*Elastic*.—Gum camphor, 60 parts; copal, 250 parts; ether, 700 parts. Keep in a bottle with a ground-glass stopper; use the upper portion, which will become

### (Varnish, Defects in)

clear after a few days, or possibly weeks. This sediment has a new portion of the mixed substances added, the other being in excess, only  $\frac{1}{2}$  as much camphor and copal being added.

#### Dammar Turpentine Varnishes.

1.—Gum dammar is a soft copal, and possesses the property of solubility in nearly every solvent, including turpentine and methylated spirit. It varies in color from yellow to nearly water-white, and should be carefully selected according to the grade of varnish it is desired to make. Dammar varnishes are chiefly used as paper varnishes (the best quality being termed *crystal paper varnishes*), and as varnishes for enamels.

2.—Turpentine, 100 fl.oz.; gum dammar, 80 oz.; sandarac resin, 40 oz.; mastic resin, 8 oz.

#### Dead Surface Varnish.

Varnishes that leave a dead surface on drying, capable of substitution for ground glass, as for glass stereographs, and of use in retouching negatives, may be made by mixing solutions of resin with liquids in which they are insoluble. A solution of sandarac resin in ether, when mixed with  $\frac{1}{4}$  as much benzole, affords an excellent imitation of ground glass; one of dammar resin in benzole, when mixed with ether, also gives a good dead surface; water instead of the ether renders it, at the same time, semi-opaque. A mixture of benzole with common negative varnish frequently, but not always, gives a beautiful dead surface. In all cases a great deal depends on the purity of the ingredients. It is recommended to dissolve from 3 to 5 parts of sandarac in 48 parts of ether, and to add 24 parts of benzole; or as much as may be necessary to produce the desired result. The following, by Hughes, is said to give a perfectly colorless varnish of this kind: Ether, 560 gr.; benzole, 240 gr.; sandarac, 40 gr.; Canada balsam, 10 gr. The resins are first to be dissolved in the ether, and the benzole added to the solution.

#### Defects in Varnishes.

Varnishes, when used and exposed to the air, are subject to certain defects which may develop; it is often rather difficult to account for the production of these faults, inasmuch as they do not show themselves every time the particular sample of varnish is used.

*Cracks*.—When cracks form in the coat of varnish, on exposure, it is mostly due to too great an excess of gum, or, more

## Paints, Varnishes, Etc.

### (Varnish, Engraving)

often, to too large a quantity of driers being used in the preparation of the varnish.

**Blooming.**—A peculiar white, lusterless appearance, which may show itself either in patches or over the surface coated with the varnish. If this fault be due to the varnish itself it is caused by careless or insufficient running of the gum, or by using the varnish in too new a condition. Sometimes it is due to the surface that is varnished being damp, and there are other causes. Streakiness is due to the varnish being too thick or too thickly applied.

**Drawings.** (See Lithographs.)

### Dull Varnish.

A varnish which does not reflect light is prepared by mixing a solution of rosin with some liquid in which rosin is insoluble. A mixture of 3 to 5 parts of sandarac, dissolved in 48 parts of ether and 2½ parts of benzole, resembles ground glass when dry. A solution of dammar rosin in benzol, mixed with ether, gives a good dull varnish. Water renders the varnish semi-opaque. Ether, 560 grams; benzol, 240 grams; sandarac, 40 grams; Canada balsam, 10 grams.

### Earthenware.

Equal parts of pulverized glass and soda are mixed. The mixture is then dried over a good fire and spread upon burnt vessels while they are still hot.

### Ebony.

- 1.—Methylated spirit, 160 fl.oz.; nigrosine (for spirit), 2 oz.; shellac, 24 oz.
- 2.—**Polish.**—Powdered garnet lac, 112 lb.; powdered gum elemi, 12 lb.; spirit black (aniline), 4 lb.; methylated spirit, 50 gal.

### Electrical Varnish.

A varnish formed by dissolving orange shellac in 95% alcohol is indispensable for all kinds of electrical work, and for finishing wood and metal work. It may be readily colored by the addition of pigments. For brown, the red and black may be mixed; for purple, the red and blue; for yellow, finely powdered yellow ochre or chrome yellow may be added; for a dead black varnish, alcohol, with a small percentage of shellac varnish added, mixed with calcined lampblack, answers an excellent purpose.

### Engraving.

- 1.—**Copper.**—a.—Yellow wax, 1 oz.; mastic, 1 oz.; asphaltum, ½ oz. Melt.

### (Varnish for Frames)

pour into water, and form into balls for use.

- b.—A softer varnish for engravers is made with tallow, 1 part; yellow wax, 2 parts.

- 2.—**Glass.**—a.—Wax, 1 oz.; mastic, ½ oz.; asphaltum, ¼ oz.; turpentine, ½ dr.
- b.—**Mastic,** 15 parts; turpentine, 7 parts; oil of spike, 4 parts.

### Ether Varnish.

Take 1 oz. of amber-colored copal, finely powdered, and place it in a flask containing 4 oz. of ether; cork the flask with a glass stopper, and shake it for half an hour. Let it rest until the liquor becomes perfectly clear.

### Fans, Varnish for.

Mastic, 15 parts, dissolved with 40 parts of sandarac in 250 parts of alcohol, and 20 parts of Venice turpentine are added.

### Fatty Varnish, for Painters.

Sandarac, 120 grams; mastic, 30 grams; Venetian turpentine, 6 grams; boiled linseed oil, or poppy oil, 750 grams; spirits of turpentine, 90 grams.

### Ferrotypes.

Alcohol, 95% strong, 50 parts; white shellac, 12 parts; to which add a few drops of oil of lavender.

### Films. (See Picture Varnish.)

### Flexible Varnish. (See also Balloon Varnish and India-rubber Varnish.)

- 1.—India-rubber, cut small, 1½ oz.; chloroform, ether, or carbon bisulphide, 20 fl.oz.; digest without heat until the solution is complete.
- 2.—Same, only substituting gutta percha for india-rubber.
- 3.—Dissolve 1 oz. of india-rubber in 1 pt. of benzole by digesting with gentle heat. This varnish dries badly.

### Frames, Varnishing of.

- 1.—Alcohol, 90%, 1 pt.; sandarac, 2 oz.; mastic, in drops, 1 oz.; shellac, 2 oz.; Venice turpentine, ¾ oz. Place the ingredients on a sand bath, let boil, stirring well. When well mixed add 1 oz. of spirits of turpentine, boil ½ hour, let cool, and strain through cotton cloth, applying the same to the frame with a brush.
- 2.—**Dead Black.**—Seed lac, 120 to 140 parts; ammonia water, 90 to 110 parts; extract of hæmatoxyline fluid, 20 parts; copper sulphate, 1 part; lead acetate, 10 parts; ivory black, q. s. Let the lac soak

## Paints, Varnishes, Etc.

### (Varnish, Gold)

in the ammonia till it becomes gelatinous, then add the water, after having dissolved in it the extract and metallic salts. Finally, stir in sufficient burnt ivory to give it the proper consistency. Bone black or ordinary lampblack may be used if for common or ordinary frames.

3.—*Dead Ground Varnish for Imitation, etc.*—Dissolve 1 lb. of shellac in a little alcohol, and 1 lb. of whiting and enough alcohol to make 1 gal. of varnish.

#### Furniture Varnish.

1.—White wax, 6 oz.; oil of turpentine, 1 pt. Dissolve by a gentle heat. Used to polish wood by friction. (See **Cabinet-makers' and Copal Varnishes.**)

2.—Shellac, 1½ lb.; naphtha, 1 gal.; dissolve, and it is ready, without filtering.

3.—Shellac, 12 oz.; copal, 3 oz. (or an equivalent of varnish); dissolve in 1 gal. of naphtha.

4.—Shellac, 1½ lb.; seed lac, 4 oz.; sandarac, 4 oz.; mastic, 2 oz.; 90% alcohol, 1 gal. Dissolve.

5.—Shellac, 2 lb.; benzoin, 4 oz.; spirit, 1 gal.

#### Glass, Varnish for.

1. Dissolve tragacanth in white of an egg, beaten up to a froth. Allow it to stand for 24 hours.

2.—Pulverize a quantity of gum adragant and let it dissolve for 24 hours in the white of eggs, well beaten up; then rub it gently on the glass with a soft brush. Not recommended.

#### Glass Varnish.

1.—A name applied to a solution of sodium silicate, or water glass.

2.—Fuse together 15 parts of powdered quartz (or fine sand), 10 parts of potash and 1 part of charcoal. Pulverize the mass, and expose it for some days to the air; treat the whole with cold water, which removes the foreign salts, etc. Boil the residue in 5 parts of water until it dissolves. It is permanent in the air, and not dissolved by cold water. Used to protect wood, etc., from fire.

3.—*Ground-Glass Varnish.*—Sandarac, 90 gr.; mastic, 20 gr.; ether, 2 oz.; benzole, ½ to 1½ oz. The proportion of the benzole added determines the nature of the matt obtained.

#### Gold Varnish.

1.—Shellac, 16 parts; gum sandarac, 3 parts; mastic, 3 parts; crocus, 1 part; gum gamboge, 2 parts; all bruised, with alcohol, 144.

### (Varnish, Gold)

2. Seed lac, 8 parts; sandarac, 8 parts; mastic, 8 parts; gamboge, 2 parts; dragon's blood, 1 part; white turpentine, 6 parts; turmeric, 4 parts; bruised, with alcohol, 120.

3.—Gum gutta, 40 parts; dragon's blood, 5 parts; alcoholic extract of sandalwood, 5 parts; blond shellac, 75 parts; sandarac, 75 parts; larch turpentine, 25 parts; 90% alcohol, 900 parts. Mix, and dissolve by the aid of a gentle heat. This varnish is not of great brilliancy of surface, but its transparency preserves the natural appearance of the gold.

4. For gilt surfaces that have become tarnished, or which are covered with pinchbeck, or imitation gold, the following is said to be better: Gum gutta, 30 parts; alcoholic extract of sandalwood, 3 parts; blond shellac, 200 parts; sandarac, 50 parts; larch turpentine, 25 parts; 95% alcohol, 800 parts. Mix, and dissolve as before.

5.—*Moldings.*—a.—Seed lac, 2 parts; mastic, 2 parts; gamboge, 1 part; alcohol, 14 parts.

b.—Seed lac, 2 parts; shellac, 2 parts; gamboge, 6 parts; saffron, 1 part; annatto, 2 parts; alcohol, 15 parts.

c.—Seed lac, 2 parts; sandarac, 4 parts; elemi, 4 parts; gamboge, 2 parts; dragon's blood, 2 parts; turmeric, 1 part; alcohol, 45 parts.

d.—Shellac, 4 parts; sandarac, 4 parts; mastic, 2 parts; Venice turpentine, 5 parts; rosin, 1 part; dragon's blood, 4 parts; gamboge, 4 parts; alcohol, 70 parts.

e.—Shellac, 1.5 parts, by weight, in alcohol, 30 parts; mastic, 2.5 parts, in alcohol, 5 parts; sandarac, 1.5 parts, in alcohol, 5 parts; gamboge, 2.5 parts, in alcohol, 5 parts; turpentine, 1.5 parts, in alcohol, 5 parts; sanders, 1.5 parts, extracted with alcohol, 5 parts. The ingredients to be dissolved separately, filtered, and mixed.

f.—Amber, 25 parts; dragon's blood, 20 parts; gamboge, 25 parts; seed lac, 100 parts; saffron, 1 part; sanders, 3 parts; alcohol, 500 parts.

g.—Shellac, 1.2 parts; sandarac, 0.5 part; gamboge, 0.25 part; red sanders, 0.2 part; Venice turpentine, 0.15 part; 95% alcohol, 5 parts. The sanders is first extracted with a part of the alcohol.

h.—Imitation Gold Moldings. 1.—Sandarac, 10 parts; elemi, 1 part; mastic, 1 part; alcohol, 20 parts.

2.—Matt Varnish.—Pale shellac, 0.25 part; absolute alcohol, 2 parts; chalk, 0.25 part.

## Paints, Varnishes, Etc.

### (Varnish, Insulating)

#### Guaiacum Varnish.

Gum guaiacum, 2 oz.; shellac, 2 oz.; methylated spirit, 10 oz. Powder the gum, dissolve in the spirit, filter, add the shellac. Keep in jar surrounded by warm water until dissolved.

#### Guns.

*Barrels*.—1.—Shellac, 1½ oz.; dragon's blood, 3 dr.; rectified spirit, 1 qt. Apply after the barrels are browned.

2.—*Stocks*.—Shellac, 5 oz.; sandarac, ½ oz.; Venice turpentine, 1 dr.; alcohol, 2 qt.

#### Gutta Percha Varnish.

Clean ¼ lb. of gutta percha in warm water from adhering impurities, dry well, dissolve in 1 lb. of rectified rosin oil, and add 2 lb. of linseed-oil varnish, boiling hot.

#### Hats. (See Straw Hats.)

#### Harness Varnish.

1.—Isinglass, 1 oz.; indigo, 1 oz.; log-wood, 1 lb.; best glue, 1 lb.; soft soap, 8 oz.; vinegar, 2 qt.; mix by heat, and strain.

2.—Alcohol, 2 gal.; white turpentine, 3 lb.; shellac, 3 lb.; Venice turpentine, ½ pt. When the rosins are all dissolved add a little olive oil, and color, if desired, with lampblack.

#### India Rubber Varnish.

1.—India-rubber, finely divided, 2 oz., placed in a phial, and digested in a sand bath, with ¼ lb. of camphene and ¼ oz. of naphtha. When dissolved, add 1 oz. of copal varnish, which renders it more durable.

2.—Digest in a wide-mouthed glass bottle 2 oz. of india-rubber in shavings, with 1 lb. of oil of turpentine, during 2 days, without shaking; then stir up with a wooden spatula. Add another pound of oil of turpentine, and digest, with frequent agitation, until all is dissolved. Mix 1½ lb. of this solution with 2 lb. of white copal-oil varnish, and 1½ lb. of boiled linseed oil; shake, and digest in a sand bath until they have united into a good varnish.

#### Inflexible.

Shellac, 4 oz.; wood naphtha, 1 pt.; lampblack, q. s. to color; dissolve.

#### Insulating Varnishes.

*For Earth Cables and Exposed Strong Current Wires*.—1.—Melt 2 parts of asphalt together with 0.4 part of sulphur; add 5 parts of linseed-oil varnish, linseed oil or cotton-seed oil, keep at 160° C. for

### (Varnish, Iron and Steel)

8 hours; next pour in oil of turpentine as required.

2.—Mix 3 parts of elaterite with 2 parts of linseed-oil varnish at 200° C. for 5 to 6 hours; next, melt 3 parts of asphalt, pour both substances together, and again maintain the temperature of 200° C. for 3 to 4 hours, and then add 1 part of linseed-oil varnish and oil of turpentine, as required.

*Dynamos and Conduits with Low Tension*.—a.—Shellac, 4 parts; sandarac, 2 parts; linoleic acid, 2 parts; alcohol, 15 parts.

b.—Shellac, 4 parts; sandarac, 4 parts; elemi, 1 part; alcohol, 20 parts.

*Shellac Varnish (Used by Large Electrical Works)*.—a.—Shellac, 100 lb.; methylated spirit, 40 gal. Contains no auramine or oxalic, but may contain acid brown or Bismarck brown.

b.—Extra Stout.—Shellac, 84 lb.; methylated spirit, 12 gal. Auramine and oxalic acid. Makes 19 gal.

#### Iron and Steel.

1.—Dissolve in alcohol: Mastic, 10 parts; camphor, 5 parts; sandarac, 15 parts; elemi, 5 parts. Apply cold.

2.—*Iron Work*.—a.—Dissolve in about 2 lb. tar oil, ½ lb. asphaltum, and a like quantity of pounded rosin, mix hot in an iron kettle, care being taken to prevent any contact with the flame. When cold the varnish is ready for use. This varnish is for outdoor wood and iron work.

b.—Black Varnish.—Boil sulphur in turpentine, apply with a brush and after heating, the iron becomes of an intense and brilliant black.

c.—Sheet Iron.—Melted colophony, 60 gr.; amber, 90 gr. After fusion and cooling, add: Spirits of turpentine, 45 gr.; painters' varnish, 45 gr. If the varnish is too thick, dilute it with essence.

3.—*Steel (Dress Swords, etc.)*.—Gum sandarac, 15 parts; small mastic, 10 parts; elemi, 5 parts; camphor, 3 parts. Dissolve the whole over the water bath in sufficient alcohol for the purpose. This varnish is used cold. (Parts by weight.)

4.—*Preservative Varnish for Iron Work*.—a.—Common rosin, 56 lb.; gutta percha, 2 lb.; dried sulphate of zinc, 2 lb.; mineral naphtha, 8 gal. Sweet the rosin and gutta percha together, then sprinkle in the sulphate of zinc, cool to 130° F., and add the naphtha.

b.—(Also used as a first coating for ships' bottoms, previous to the application of anti-fouling compositions.)—Common rosin, 112 lb.; gutta percha, 8 lb.; stear-



## Paints, Varnishes, Etc.

### (Varnish, Label)

ate of zinc, 8 lb.; mineral naphtha\*, 24 gal. (\*) This may be coal tar naphtha or benzine.

c.—*Stearate of Zinc* (used in above).—White curd soap, 28 lb.; sulphate of zinc, 8 lb. Process.—Dissolve the sulphate of zinc and soap separately in boiling water. Mix together while boiling, dry and fuse stearate for use.

5.—*Smiths, Locksmiths and Iron Foundry*.—a.—Heat 200 parts by weight of pine oil and dissolve in it 25 parts of Syrian asphalt and 25 parts of rosin, previously crushed a little. When cool, pour the varnish into a bottle and keep. When heating the pine oil, be careful that the vapors do not come into contact with the fire or the oil will ignite.

b.—*Brown Varnish for Locksmiths' Goods*.—Such a varnish for bright goods to be dried in the stove is prepared as follows: Heat 10 parts of Syrian or Gisonite asphalt, 30 parts of matured linseed oil, 2 parts of red lead, and 2 parts of litharge until the mixture draws threads, let cool, and stir 30 parts of oil turpentine into it. (See also *Machinery; Metals*.)

### Japan Varnish, Black.

Naples asphaltum, 50 lb.; dark gum arabic, 8 lb. Fuse, add 12 gal. linseed oil; boil, then add of dark gum amber, 10 lb., previously fused and boiled in 2 gal. linseed oil; next add q. s. of driers and thin with oil of turpentine.

### Label Varnish.

1.—Sandarac, 60 parts; mastic, 25 parts; camphor, 1 part; oil of lavender, 8 parts; Venice turpentine, 4 parts; ether, 6 parts; alcohol, 95%, 44 parts. Mix and macerate together and set aside to dissolve, giving the container an occasional shake. It takes several days to effect complete solution, but the resultant article is worth the trouble. Thin where necessary with alcohol to which 12% of ether is added, or absolute alcohol alone.

2.—Mastic, 8 parts; copaiba balsam, 4 parts; Venice turpentine, 6 parts; oil of turpentine, 8 parts; sandarac, 24 parts; alcohol, 95%, 80 parts. Mix and let stand in a close vessel until the gums and rosins are completely dissolved, facilitating solution by frequent agitation. Let stand a few days, in perfect quiet, then cautiously decant. To secure a brilliant and glossy surface, first varnish the label with thin collodion, give it 2 coats, and let the first dry before applying the second. Neither varnish turns yellow, and when applied to white paint

### (Varnish, Leather)

it not only gives it a brilliant luster but protects it from yellowing.

### Laboratory Tables.

To Protect Laboratory Benches from Acids and Alkalis.—Solution (a): Copper sulphate, 125; potassium chloride, 125; water, 1,000. Heat until dissolved. Solution (b): Aniline hydrochloride, 150; water, 1,000. Solution (a) is first brushed on, and then (b), the application being allowed to dry. Next day the bench is rubbed with raw linseed oil, this treatment being repeated once a month.

### Lac Varnish.

1.—Seed lac, 8 oz.; alcohol, 1 qt.; digest in a close vessel in a warm situation for 3 or 4 days, then decant and strain. Highly recommended.

2.—Substitute lac bleached by chlorine for seed lac. Both are very tough, hard and durable, the last almost colorless. Used for pictures, metal, wood or leather.

3.—*Lac Water Varnish*.—Pale shellac, 5 oz.; borax, 1 oz.; water, 1 pt. Digest at nearly the boiling point till dissolved, then strain. An excellent vehicle for water colors, inks, etc., and a varnish for prints is made thus of bleached lac. When dry, it is transparent and water proof.

### Leather Paints and Varnishes.

1.—Shellac, 1 part; turpentine, 5 parts; prepared spirit, 15 parts. To prepare the spirit add to every 15 l. of alcohol (wood) 500 gr. extract of logwood and 25 gr. of potassium dichromate and dissolve; then add the shellac and turpentine.

2.—Ruby shellac, 30 parts; Venice turpentine, 1 part; sandarac, 1 part; castor oil, 1 part; alcohol, 150 parts; levulin black, 5 parts.

3.—Rosin, 3 parts; turpentine, 3 parts; oil turpentine, 3 parts; sandarac, 6 parts; shellac, 12 parts; lampblack, 1 to 5 parts; alcohol, 90%, 40 parts.

4.—Venice turpentine, 3 oz.; alcohol, 8 oz.; nigrosine, 30 gr.; aniline blue, 8 gr. Dissolve the aniline colors in a little alcohol before adding to the other ingredients.

5.—a.—Durable leather varnish is composed of boiled linseed oil, in which a drier, such as litharge, has been boiled. It is colored with lampblack. This varnish is used for making enameled leather.

b.—Shellac, 12 parts; white turpentine, 5 parts; gum sandarac, 2 parts; lampblack, 1 part; spirits of turpentine, 4 parts; alcohol, 90 parts.

## Paints, Varnishes, Etc.

### (Varnish, Lithographs)

c.—Dull Black.—Alcohol, 95%, 500 parts; shellac, 125 parts; wax, 15 parts; turpentine, 10 parts; spirit-soluble nigrosine, 10 to 15 parts.

d.—Glossy Black, Volatile.—1.—Alcohol, 95%, 500 parts; shellac, 70 parts; turpentine, 20 parts; spirit-soluble nigrosine, 10 parts.

2.—Alcohol, 95%, 500 parts; shellac, 90 parts; sandarac, 15 parts; turpentine, 10 parts; castor oil, 6 parts; spirit-soluble nigrosine, 12 to 15 parts.

3.—Alcohol, 95%, 500 parts; shellac, 70 parts; colophony, 30 parts; rosin oil, 10 parts; turpentine, 10 parts; spirit-soluble nigrosine, 10 to 15 parts.

4.—Alcohol, 95%, 500 parts; shellac, 60 parts; sandarac, 25 parts; colophony, 15 parts; turpentine, 25 parts; turpentine oil, 15 parts; spirit-soluble nigrosine, 12 to 15 parts.

6. *Metals to Leather, Varnish for Fastening*.—Dissolve 1 oz. of gum arabic in water and an equal amount of isinglass in brandy.

7. *Packet Books, etc.*—Use 6 oz. of mastic, in drops; 3 oz. of coarsely powdered glass, separated from the dust by a sieve; 32 oz. of spirits of wine of 40°. Place the ingredients in a sand bath over a fire, and let them boil, stirring well. When thoroughly mixed, introduce 3 oz. of spirits of turpentine, boil for half an hour, remove from the fire, cool, and strain through cotton cloth. Great care in manipulation is requisite to avoid a conflagration. Use a closed fire and watch incessantly.

### Linseed Oil Varnish.

Boil linseed oil, 60 parts, with litharge, 2 parts; white vitriol, 1 part; each finely powdered until all water is evaporated. Then set by. Or, rub up borate of manganese, 4 parts, with some of the oil, then add linseed oil, 3,000 parts, and heat to boiling.

### Lithographs.

1.—Put 2 qt. of the best linseed oil into a saucepan large enough to hold 1 gal. The lid should have a long handle, so that it may be put on the vessel with safety while the contents are burning. Set it on a clear fire until the white fumes arise. Apply a lighted paper occasionally until these fumes catch fire and burn. It must now be watched carefully, so that the flame shall not become unmanageable. If the flame goes down a little it may be increased by stirring with an iron rod. If it shows a tendency to rise too high, it may be removed

### (Varnish, Mahogany)

from the fire, when it will still continue to burn. If it rises too high and threatens to become dangerous, the lid must be put on, when the flame, being deprived of the access of air, will be extinguished. If the flame has been very high, the lid should be kept on long enough to allow the whole of the oil to cool down a little. The oil is burned until it becomes 1-6 less. A thick slice of bread is now put in and moved about with a fork until it is browned. It is then allowed to burn a little more, it being set on the fire again to revive the flame if the latter has become dull. A second slice is now put in and browned as before. This proceeding is said to free the oil from its more greasy particles. One-fourth of the oil may now be taken away. If, on becoming cold, it is of a syrupy nature, it may be set aside for thin varnish. The rest having been burned again for a short time, 1-3 part is taken away. This is medium varnish. The remainder is again burned and ½ set aside for strong varnish. The fourth portion is again burned, and when cold should be thick and ropy. It is necessary to take every precaution to guard against accident.

2.—*Lithographs and Drawings*.—Dextrine, 20 parts; alcohol, 5 parts; water, 20 parts. Give a couple of coats of starch paste, then varnish.

### Machinery.

1.—*Asphaltum Varnish*.—First paint the articles in a japan color such as the following: Asphaltum, 3 oz.; boiled oil, 4 qt.; burned umber, 8 oz. Mix by heat, and when cooling, thin with turpentine. Then coat them with a suitable transparent or light varnish.

2.—*Agricultural Machines*.—Obtainable in a variety of colors, such as green, red, blue, etc., they must possess brilliant luster and adhere to the iron almost as firmly as enamel. They may be produced, of excellent quality, according to the following recipe: In 120 parts of 95% alcohol dissolve 80 parts of soft manilla copal, 40 parts rosin, and when the solution is complete add 30 parts of castor oil. The varnish is rubbed down, in the proportion of 4 to 7, with any desired bright color. (See also IRON; METALS.)

### Mahogany.

1.—Methylated spirit, 160 fl.oz.; dragon's blood, 1 oz.; shellac, 24 oz. Digest the dragon's blood for several days in the spirit before dissolving therein the shellac. But the color of mahogany is better imitated by using Bismarck brown red, with

## Paints, Varnishes, Etc.

### (Varnish, Mordant)

just a little nigrosine to tone down the redness.

2.—Methylated spirit, 160 fl.oz.; sandarac rosin, 16 oz.; shellac, 8 oz.; Venice turpentine, 9 oz.; dragon's blood, 4 oz.

#### Maps, Prints, etc.

1.—Gum mastic, 5 oz.; gum sandarac, 2 oz.; gum camphor, 1 oz.; alcohol, 95%, 16 oz.

2.—Balsam of Canada, 2 oz.; spirits of turpentine, 4 oz. The paper should first be sized with a solution of isinglass, and dried before applying the varnish.

3.—Use Canada balsam or dammar varnish. The principal trouble will be in removing the old wax. The paper must be perfectly dry.

4.—Mounted maps are sized with thin white glue and varnished with mastic.

**Mastic Varnish.** (See **Picture Varnish**.)

#### Matt Varnish.

1.—Gum mastic, 40 gr.; gum sandarac, 160 gr.; methylated spirit, 4 oz.; benzole, 1½ oz.

2.—Sandarac, 18 parts; mastic, 4 parts; ether, 20 parts; benzole, 80 to 100 parts. See that the glass is perfectly clean.

3.—*Black*.—a.—Gum mastic, 50 gr.; gum sandarac, 200 gr.; methylated ether, 1½ oz.; benzol, ½ oz.

b.—For Wood.—Shellac, 40 parts; borax, 20 parts; glycerine, 20 parts; aniline black, 50 parts; water, 500 parts. Dissolve the borax in the water, add the shellac and heat until solution is effected; then add the other ingredients.

#### Mechanics, Varnish for.

Rosin, 5 parts; dragon's blood, 1 part; gamboge, 1 part; gutta percha, 2 parts; shellac, 1 part; volatile tar oil, 40 parts.

#### Metals.

1.—To make alcoholic laquers or varnishes adhere more completely to polished metal surfaces, 1 part boric acid should be added to 200 parts of varnish. This composition will adhere so firmly and become so completely glazed as to be removed only with difficulty. Be careful not to add too much of the boric acid, as it injures the gloss in that case.

2.—Copal, 1 part; alcohol, 2 parts.

3.—Copal, 1 part; oil rosemary, 2 or 3 parts; alcohol. Apply hot.

(See also **Iron**; **Machinery**.)

#### Mordant Varnish.

Take 1 oz. of mastic, 1 oz. of sandarac, ½ oz. of gum gamboge, and ¼ oz. of

### (Varnish, Organ)

turpentine; dissolve in 6 oz. of spirits of turpentine. Or, place a quantity of boiled oil in a pan, and subject it to a strong heat. When a black smoke arises, set it on fire, and in a few moments extinguish it by covering over the pan; then pour the whole, while heated, into a bottle previously warmed, adding to it a little oil of turpentine.

#### Naphtha Polish.

1.—Wood naphtha, 5 gal.; orange shellac, 12 lb.

2.—*Naphtha French Polish*.—a.—Orange shellac, 84 lb.; powdered pale rosin, 28 lb.; methylated spirit, 25 gal.; wood naphtha, 25 gal.

b.—Orange shellac, 56 lb.; powdered pale rosin, 56 lb.; methylated spirit, 25 gal.; wood naphtha, 25 gal.

3.—*Rosin Naphtha Varnish*.—Dissolve 112 lb. rosin in 12 gal. naphtha. (Fusel oil and methylated spirit may be used.)

#### Nets.

1. The following is a good water-proof composition, and is very pliable: Dissolve soft soap in hot water and add a solution of sulphate of iron. An insoluble iron soap is precipitated, which must be collected, washed and dried. It must be then mixed to the right consistency with linseed oil and it is then ready to apply.

2.—Try paraffine wax, melted with a small portion of raw linseed oil, both for lines and nets; see that they are perfectly dry before putting them into the above hot, and you will say you have found nothing to equal it. When you take them out, wring them dry before the fire in an old duster or cloth.

#### Oak Varnish.

Kauri gum, 8 lb.; oil, 3 gal.; turpentine, 5½ gal. Dissolve the gum in the gum pot, heat the oil, and mix the two until the mixture strings well, and finally thin with the turpentine.

#### Optical Goods and Ornamental Iron Work, Dead Black for.

Dissolve seed lac in 95% alcohol q. s. Mixed refined lampblack with alcohol and add enough seed lac varnish to make the lampblack adhere, but not enough to give it a gloss. Strain through cheese cloth. Apply with a soft varnish brush.

#### Organ Varnish.

This varnish consists of a solution of very fine bleached shellac 25 kilos, in spirit 75 kilos.

## Paints, Varnishes, Etc.

### (Varnish, Picture)

#### Paper Varnish.

1.—The following form affords very good varnishes for drawings that have been previously sized with gelatine: Canada balsam, 1 oz.; oil of turpentine, 2 oz.; or, Canada balsam, 4 oz.; camphene, 8 oz.

2.—Dissolve sandarac, 15 kilos, and common, though pure, thick turpentine in spirit, 45 kilos.

#### Patterns, Varnish for.

1. Alcohol, 1 gal.; shellac, 1 lb. Lamp or ivory black, sufficient to color it. (See also Machinery, above.)

2. Shellac, 30 lb.; manilla copal, 10 lb.; and Zanzibar copal, 10 lb., are placed in a vessel, which is heated externally by steam, and stored during 4 to 6 hours, after which 150 parts of the finest potato spirit are added, and the whole heated during 4 hours to 87° C. This liquid is dyed by the addition of orange color, and can then be used for painting the patterns.

#### Photographic Trays.

Use asphaltum varnish, or coat the bottom and sides of the wooden tray with: Rosin, 1 part; beeswax, 2 parts; paraffine, 3 parts. Melt these together, warm the tray, and while hot apply with a brush.

#### Picture Varnish.

1. Several varnishes are called by this name. Pale copal or mastic varnish is generally used for oil paintings, and crystal, white hard spirit, or mastic varnish, for water-color drawings on paper.

2.—Solution of Venice turpentine, 8 kilos, and sandarac, 8 kilos, in spirit, 28 kilos.

3.—Mastic, 175 parts; turpentine, 45 parts; camphor, 15 parts; pulverized glass, 150 parts; alcohol, 110 parts. Mix and dissolve.

4.—*Mastic Varnish.*—*a.*—Fine. Very pale and picked gum mastic, 5 lb.; glass pounded as small as barley, and well washed and dried, 2½ lb.; rectified turpentine, 2 gal.; put them into a clean 4 gal. stone or tin bottle, bung down securely, and keep rolling it backward and forward pretty smartly on a counter or any other solid place for at least 4 hours; when, if the gum is all dissolved, the varnish may be decanted, strained through muslin into another bottle, and allowed to settle. It should be kept for 6 or 9 months before use, as it thereby gets both tougher and clearer.

*b.*—Second Quality.—Mastic, 8 lb.; turpentine, 4 gal.; dissolve by a gentle

### (Varnish, Playing Cards)

heat, and add pale turpentine varnish, ½ gal.

*c.*—Gum mastic, 6 oz.; oil of turpentine, 1 qt.; dissolve. Mastic varnish is used for pictures, etc.; when good, it is tough, hard, brilliant and colorless.

*d.* 1 pt. spirits of turpentine and 10 oz. of the clearest gum mastic. Set it in a sand bath till it is dissolved, then strain it through a fine sieve, and it is ready for use; if too thick, thin with spirit of turpentine.

5. *Paintings.*—Take of mastic, 4 oz.; pure turpentine, ½ oz.; camphor, 2 dr.; spirits of turpentine, 19 oz. Add first the camphor to the turpentine; the mixture is made in a water bath. When the solution is effected, add the mastic and the spirits of turpentine near the end of the operation; filter through a cotton cloth.

6. *Prints.* *a.* A compound of benzole and almond oil. This print varnish does not give the slightest glaze to photographs on plain paper.

*b.*—Dissolve 1 oz. of the best isinglass, or London single size, in 1 pt. of hot water by boiling, strain it fine and keep it for use. Add or diminish the isinglass or size till it merely dulls the surface. Give the print 2 or 3 coats with a flat camel's-hair brush, letting it dry between each; then with best mastic varnish, give it 2 coats. (See also Ferrotypes; Lithographs.)

**Picture Frames.** (See Frames.)

#### Plaster Casts.

Take ½ oz. of tin, together with the same quantity of bismuth, and fuse in a crucible. When perfectly dissolved, add ½ oz. mercury. This substance, when mixed with the white of egg, forms a beautiful varnish for plaster casts.

#### Playing Cards.

Gum elemi, 56 lb.; methylated spirit, 4 gal.

*Retouching Varnish.*—1.—Sandarac, 1 oz.; castor oil, 80 gr.; alcohol, 6 oz. First dissolve the sandarac in alcohol, and then add the oil.

2.—Luckardt's.—Alcohol, 150 parts; sandarac, 25 parts; camphor, 2½ parts; castor oil, 5 parts; Venetian turpentine, 2½ parts.

3.—Alcohol (sp. gr. 0.830), 60 parts; sandarac, 10 parts; camphor, 2 parts; Venetian turpentine, 4 parts; oil of lavender, 3 parts. This varnish may also be used for paper pictures. The retoucher

## Paints, Varnishes, Etc.

### (Varnish, Sculpture)

should not set to work as soon as the negative has been varnished, as the film will not then be hard enough to bear the touch of a lead pencil. The varnished film is in best condition for retouching when a day old.

#### Printer's Varnish.

*For 1st.* To each cwt. linseed oil (clarified) add 50 lb. clear black rosin and 5 lb. oil of turpentine. The varnish is now ready to be incorporated with the coloring matter.

*Tar Oil Varnish.* Linseed oil, 50 parts; litharge, 3 parts; pine rosin, 20 parts; tar varnish oil, 10 parts. The litharge is boiled with the linseed oil and pine rosin until the mass commences to draw threads in cooling; the varnish oil is then added.

*Retouching.* (See Picture Varnish.)

#### Rosin Benzine Varnish.

Rosin, 200 lb.; oxide of manganese, 7 lb.; benzine, 35 gal.

#### Rosin Turpentine Varnish.

Dark rosin, 100 lb.; turps, 8 gal. Put 100 lb. dark rosin in pot, add turps with it. Put on slow fire until all the rosin has melted, take off fire. If too stout, add more turps.

#### Rubber, Shellac Varnish for.

1. Powder shellac and soak in well-stoppered bottle with 10 times its weight of strong ammonia. Allow it to stand for a number of days, when the shellac disappears. Sometimes several weeks are required to effect complete solution. If for use on overshoes, add a little lamp-black.

2. Rubbers.—Dissolve 1 oz. finely powdered shellac in 10 oz. of strong ammonia. This must be kept in a bottle with a ground glass stopper. After several days the shellac will become dissolved. Apply with a rag.

#### Sculpture Varnish.

1.—Dissolve Venice turpentine, 5 kilos, and sandarac gum, 6 kilos, in 95% spirit, 20 kilos.

2.—*Bronze for Statuary.*—Cut best hard soap, 50 parts, into fine shavings; dissolve in 2 parts of water; add solution blue vitriol, 15 parts, in water, 60 parts; wash with water, dry slow. Dissolve in turpentine.

3.—*Wax Varnish to Preserve Statues and Marble Exposed to the Air.*—Melt 2 parts of wax in 8 parts of pure essence of turpentine. Apply hot, and spread

### (Varnish, Silver)

thinly, so as not to destroy the lines of the figures. This varnish may be used upon statues which have been cleansed with water dashed with hydrochloric acid, but they must be perfectly dry when the application is made.

#### Sealing Wax Varnish.

Dissolve sealing wax of any color in strong alcohol. Apt to be rather brittle.

#### Shellac Varnish. (See also Rubber.)

1.—(a) Shellac, 60 grams; (b) alcohol, 60 grams; (c) castor oil, 25 grams; (d) alcoholic solution of aniline dye, a few drops. (a) and (b) are dissolved, and heated until quite thick, then a little of (d) is added, and for every 60 grams of the mixture add 25 grams of castor oil, and heat for a short time.

2. *Harris*. Put 1 oz. shellac into a wide mouthed 8 oz. phial, containing 5 oz. of rectified naphtha or wood spirit. Cork and stand in a warm place until the gum is dissolved. Shake frequently and filter, adding more naphtha to assist the filtering, and changing the filter from time to time.

3.—*Imitation.* The following article under this name is used by furniture dealers: Gum sandarac, 1½ lb.; pale rosin, 1½ lb.; benzine, 2 gal. Dissolve by gentle heat. The varnish is quick-drying.

4. *White.*—Dissolve 1 part of pearl-ash in about 8 parts of water; add 1 part of shellac, and heat the whole to the boiling point. When the lac is dissolved, cool the solution, and saturate it with chlorine until the lac has all settled. When it is dissolved in alcohol it forms a varnish which is transparent as any copal varnish.

#### Shovel Varnish.

W. W. rosin, 125 lb.; dammar, 37 lb.; sulph. zinc, 2 lb.; turps, 25 gal.; benzine, 10 gal.; coach oil, 2 gal.

#### Sign Painter's Varnish.

To 2 qt. of drying linseed oil add 2 lb. of best copal, 1-8 lb. of lead acetate; 7-8 gal. of turpentine. Boil the copal for several hours until very thick, before adding the turpentine.

#### Silver.

1.—Gum elemi, 30 parts; white amber, 45 parts; charcoal, 30 parts; spirits of turpentine, 375 parts. It must be used in a heated state, the metal to which it is to be applied being also heated.

2.—*Oxidized.*—Alcohol, 16 parts; red

## Paints, Varnishes, Etc.

### (Varnish for Straw)

arsenic, 3 parts; essence lavender, 1 part.  
(Parts by weight.)

#### Spirit Varnish.

*Brown*.—The best do not contain rosin. Sandarac, 3 lb.; pale shellac, 2 lb.; spirit, 2 gal.; turpentine, 2 pt. Dissolve the sandarac and shellac in the spirit, and add the turpentine.

*Hard*. 1. Gum lac, 20 parts; juniper gum, 8 parts; elemi, 4 parts; alcohol, 100 parts.

2. Brown.—a. Sandarac, 4 oz.; pale seed lac, 2 oz.; elemi (true), 1 oz.; alcohol, 1 qt. Digest with agitation till dissolved, then add Venice turpentine, 2 oz.

b.—Gum sandarac, 3 lb.; shellac, 2 lb.; alcohol (65 over proof), 2 gal. Dissolve, add turpentine varnish, 1 qt.; agitate well and strain. Very fine.

c.—Seed lac, 1½ lb.; yellow rosin, 1½ lb.; rectified alcohol, 2 gal.

d.—Methylated spirit, 160 floz.; shellac, 8 oz.; sandarac rosin, 16 oz.; elemi rosin, 4 oz.; Venice turpentine, 4 oz.

e.—Brown (for common purposes). Methylated spirit, 160 floz.; shellac, 12 oz.; rosin, 12 oz.

3. White.—a.—Methylated spirit, 160 floz.; sandarac rosin, 40 oz.; gum thus, 16 oz.

b.—Methylated spirit (65 above proof), 160 floz.; sandarac rosin 40 oz.; camphor, ½ oz.; coarsely powdered glass, 16 oz. After straining, add 20 floz. of pale turpentine varnish.

c.—Methylated spirit, 160 floz.; sandarac rosin, 24 oz.; mastic rosin, 8 oz.; elemi rosin, 4 oz. All the above hard varnishes can be polished when dry and hard. They should be laid on with a brush used always in one direction, so as not to generate froth, for if they do, they dry dull and lusterless; 24 hours is usually sufficient time to allow them before proceeding to polish.

**Statuary.** (See Sculpture.)

#### Stopping Out Varnishes (Petit Vernis).

Lampblack made into a paste with turpentine. Used by engravers.

#### Straw Hats.

1.—For dark varnishes prepare a basis consisting of: Orange shellac, 900 grams; sandarac, 225 grams; manilla copal, 225 grams; castor oil, 55 grams; wood spirit, 91. To color, add to the foregoing amount alcohol-soluble coal tar dyes as follows: Black, 55 gr. of soluble ivory black (modified by blue and green). Olive brown, 15 grams of brilliant green, 55 grams of Bismarck brown, R., 8 grams

### (Varnish, Tinner's)

of spirit blue. Olive green, 28 grams of brilliant green, 28 grams of Bismarck brown R. Walnut, 55 grams of Bismarck brown R., 15 grams of nigrosine. Mahogany, 28 grams of Bismarck brown R., which may be deepened by a little nigrosine.

2. For light colors prepare a varnish as follows: Sandarac, 1,350 grams; elemi, 450 grams; rosin, 450 grams; castor oil, 110 grams; wood spirit, 9 l. For this amount use dyes as follows: Gold, 55 grams of chrysoidin, 55 grams of aniline yellow. Light green, 55 grams of brilliant green, 7 grams of aniline yellow. Blue, 55 grams of spirit blue. Deep blue, 55 grams of spirit blue, 55 grams of indulin. Violet, 28 grams of methyl violet, 3 R crimson, 55 grams of safranin. Chestnut, 55 grams of safranin, 15 grams of indulin.

3. Dissolve 1 oz. of sealing wax in 4 oz. of strong alcohol. Digest with heat over a sand bath.

4. Black Varnish for Straw Hats.—Best black sealing wax, ½ oz.; rectified 90% alcohol, 2 oz. Powder the sealing wax and put it with the 90% alcohol in a phial; digest them in a sand bath, or near a fire till the wax is dissolved; lay on warm with a fine, soft hair brush before a fire or in the sun.

#### Table Varnish.

1.—Oil of turpentine, 1 lb.; beeswax, 2 oz.; colophony, 1 dr.

2.—Dammar rosin, 1 lb.; spirits of turpentine, 2 lb.; camphor, 200 gr. Digest the mixture for 24 hours. The decanted portion is fit for immediate use.

#### Tannin Varnish.

Alcohol, 95%, 20 parts; turpentine, 1 part; tannin, 4 to 5 parts.

#### Tar Varnish for Wood or Iron.

Coal tar, 1½ gal.; spirits of turpentine, ¾ pt.; oil of vitriol, 3 oz. Mix the tar and vitriol together with a stick, and apply with a brush as it becomes thick.

#### Terra Cotta.

Mastic, 1 part; shellac, 10 parts; Venice turpentine, 3 parts; strong alcohol, 20 parts.

#### Tinner's Varnish.

1.—Mix lampblack with shellac.  
2.—Mix Frankfort black with shellac.  
3.—Mix Frankfort black with a mixture of asphaltum and oil of turpentine, then add a little linseed oil and minium.

## Paints, Varnishes, Etc.

### (Varnish, Turpentine)

The exact proportions of tinner's varnishes are immaterial.

#### Tissue Paper, etc., Varnish for.

Add 2 parts of drying linseed oil to 1 part of the solution of india-rubber, and mix them by means of heat. Apply warm on both sides of the paper.

#### Tools, Lacquer for.

1.—Yellow wax, 4 parts; Berlin blue, 2 parts; lampblack, 1 part; turpentine oil, 16 parts; neatsfoot oil, q. s. Rub up the blue and lampblack with sufficient of the oil to make a stiff, doughy mass, and add it to the solution of the wax in the oil.

2.—Dissolve 250 grams of bleached shellac in 250 grams of alcohol, and dip the tools into it, when they may be hung up to dry.

3.—Tallow, 4 oz.; rosin, 2 oz.; melt, and strain while hot. With a brush apply a coat to the tools and it will prevent their rusting.

#### Transfer Varnish.

1.—Mastic in tears, 6½ oz.; rosin, 12½ oz.; pale Venetian turpentine, 25 oz.; sandarac, 25 oz.; alcohol, 5 pt. Dissolve in a clean bottle or can in a warm place, frequently shaking it. When the gum is dissolved strain it through a lawn sieve and it is fit for use.

2.—*Diaphanic. Engravings, etc.*—a. —Pale Canada balsam and rectified oil of turpentine, equal parts. Also termed crystal varnish.

b.—Mastic in tears and sandarac, each 4 oz.; rectified spirit, 1½ oz.; dissolve, and add pale Canada balsam, ½ pt. Melt the balsam with a gentle heat, mix with the other ingredients and agitate violently.

c.—Take 6½ oz. of mastic, in tears, 12½ oz. of rosin, and genuine pale Venice turpentine and sandarac, of each 25 oz. Dissolve, add 1 qt. of turpentine varnish, agitate well and strain.

#### Transparencies, Varnish for.

Dissolve wax in oil of turpentine.

#### Turner's Lacquer.

Gum elemi, 4 parts; shellac (bleached), 20 parts; Venice turpentine, 4 parts; strong alcohol, 60 parts.

#### Turpentine Varnish.

To 1 pt. of spirits of turpentine add 10 oz. of clear rosin, pounded; put it in a tin can on a stove and let it boil for half

### (Varnish, Violin)

an hour. When the rosin is all dissolved, let it cool and it is ready for use.

#### Umbrella Varnish.

10 parts of pulverized litharge and 20 parts turpentine are boiled in 20 parts linseed oil. Dry in the sun.

#### Veneer Liquid.

Gum anise, 8 lb.; clarified linseed oil, 3 gal.; litharge, ¼ lb.; lead acetate, ¼ lb.; iron sulphate, ¼ lb.; oil of turpentine, 5½ gal. Boil all together until the mixture strings, then mix well and strain. The aniline colors used to give such varnishes the desired shades are those known as "fat aniline colors" or "Soudan dyes." A small quantity of the desired color is mixed with a little oil of turpentine and then stirred into the varnish. These colors are not known as "oak stain" or "rosewood," but as reds, browns, etc. The proper proportions and blending would have to be learned from practice.

#### Violin Varnish.

1.—The famous Italian violin makers used, it is said, the following sort of varnish on their instruments: Rectified alcohol, ½ gal.; 6 oz. gum sandarac, 3 oz. gum mastic and ½ pt. turpentine varnish. The above ingredients are put into a tin can by the stove and frequently shaken until the whole is well dissolved. It is finally strained and kept for use. If upon application it is seen to be too thick, thin with an addition of more turpentine varnish. The wood should be stained before applying the varnish. For a red stain use camwood, logwood, or aniline.

2.—*Red Varnish for Violins.*—Dissolve over a moderate fire: Sandarac, 12 parts; shellac, 6 parts; mastic, 6 parts; elemi, 3 parts. In 150 parts 95% alcohol which has been colored red with cochineal, or if a darker red is required, add dragon's blood gum. When the above is dissolved add 6 parts Venice turpentine. As this varnish is highly inflammable, use caution as to fire. Find the tone of a piece of wood by direct comparison with similar notes on the piano or any standard instrument. A violin in tune at the proper pitch by a tuning fork is very convenient.

3.—*Tone of Wood for Sams.*—Dissolve by heat 2 oz. amber in oil of turpentine, 5 oz., and drying linseed oil, 5. Color with dragon's blood or extract alcanet root. The tone given by a piece of wood depends upon its size, thickness, etc. Therefore, a test must be comparative. Cut square plates of equal size and thickness of a known wood and of the wood to be tried.

## Paints, Varnishes, Etc.

### (Varnish, Wainscot)

Place the center of the plate upon end of a cork or spool placed upon a table near the edge. Press the center of the plate of wood with the thumb and bow it near one of the corners. This will give the lowest note such a plate can produce, or the normal tone. The higher the tone, the better the wood.

4.—Coarsely powdered gum copal and glass, each 4 oz.; alcohol, 64 o. p., 1 pt., camphor,  $\frac{1}{2}$  oz.; heat in a water bath with frequent stirring, so that the bubbles may be counted as they rise until solution is complete, and when cold decant the clear portion. When oil varnish is used it is made from artists' vinegar copal.

5.—The true Cremona varnish is of unknown formula; its preparation is a lost art. Amber, fused, 2 oz.; oil of turpentine, 5 oz.; mixing linseed oil, 5 oz. The following is for a spirit varnish: Mastic, 1 dr.; sandarac, 1 dr.; lac,  $6\frac{1}{2}$  dr.; alcohol, 5 fl.oz. To tinge with yellow, annatto, aloes, gamboge or turmeric may be used; for red, dragon's blood or red sanders wood. By mixing the above, intermediate shades may be obtained. The formula is only half the art; much depends on the application, treatment between coats, etc. It should be done by an expert.

6.—The receipt for violin varnish as used by German violin makers is 4 parts sandarac rosin, 2 parts shellac, 1 part mastic, 2 parts benzoes rosin, 2 parts Venetian turpentine, and 32 parts of alcohol. The solid ingredients are first dissolved in the alcohol and the Venetian turpentine added afterward, and finally the whole carefully filtered to get rid of all dust. Brushes to be kept scrupulously clean. For staining, campeachy wood is used, mixed with about  $\frac{1}{2}$  yellow dye-wood, and boiled for two hours in 5 times its weight of water in copper or earthenware vessel; no iron should come in contact with it, as this makes the solution black. The violins are colored with this solution when well cleaned, and afterward varnished.

7.—Coarsely powdered copal and glass, each 4 oz.; alcohol, 64 o. p., 1 pint; camphor,  $\frac{1}{2}$  oz.; heat the mixture with frequent stirring in a water bath, so that the bubbles may be counted as they rise, until solution is complete, and, when cold, decant the clear portion. When oil varnish is used it is made as for artists' virgin copal.

**Wagons.** (See Carriages; Coaches; Wicker Wagon Bodies.)

**Wainscot Varnish.**

Anime rosin, 8 lb.; clarified oil, 3 gal.;

### (Varnish, Water)

litharge, 4 oz.; dried white copperas, 4 oz.; dried sugar of lead, 4 oz.; turpentine,  $5\frac{1}{2}$  oz. Prepare as in oak varnishes.

**Walking Stick Varnish.**

*Malacca.*—Orange shellac, 56 lb.; powdered manilla copal, 25 lb.; powdered pale rosin, 25 lb.; caryodine crystals, 4 oz.; methylated spirit, 25 gal.

**Wall Paper.**

Equal parts of borax and shellac are dissolved in ten times their weight of alcohol; strain, and give two coats. For a very light-colored paper use sandarac instead of shellac. Paper treated with this lacquer can be washed with water, and even with soap, if necessary.

**Water Varnishes.**

1.—*Crystal Water Varnish.*—1 lb. of good white gum arabic and 1 lb. of glucose are dissolved in 3 pints of water. This dries hard, with a gloss.

2.—*Glazing Varnish.*—Mix 1 pint of white of egg with 1 pint of water. A little carbolic acid or salicylic acid or, better, thymol should be added to preserve this varnish. This varnish or glaze dries with a fair amount of luster. If, after being applied, it be placed in a hot room to dry, the coat will be made more waterproof. Dried albumen may be used instead of the white of egg by dissolving 1 oz. in 1 pt. of water; only the color of the glaze is not so good.

3.—*Glue Varnish.*—Made by dissolving 1 lb. of good pale glue in 2 gal. water. The color of this varnish depends very much on the quality of the glue used; if the best gelatine, then a white varnish will be made; if a brown glue, then a brown varnish. This varnish is not very good because of the sticky coat it gives, which is not waterproof; by adding just before using, a small quantity of bichromate of potassium (1 oz. in 2 gal.), the coat becomes nearly waterproof. It is important that the bichromate be added only just before use, as it would act on the varnish and cause it to set into a gelatinous unworkable mass. This varnish forms the basis of some leather varnishes. A little thymol or borax may be added as a preservative.

4.—*Lac Water Varnish.*—Shellac, 6 oz.; borax,  $1\frac{1}{2}$  oz.; and water, 1 pt. Boil together until the lac is dissolved. If bleached lac is used a white varnish will be made; if the orange shellac, the varnish will have a pale brown color. This varnish makes a fair vehicle for water colors; it is a good paper varnish, and dries



## Paints, Varnishes, Etc.

### (Whitewash)

with a fair luster and with a hard coat which is waterproof. By adding any of the soluble coal-tar colors colored varnish can be made.

#### Wax Lacquer.

White wax, 2 parts; benzol, 3 parts.

#### Wax Varnish.

Wax (pure), 5 oz.; oil of turpentine, 1 qt.; dissolve. Used for furniture.

#### White Varnish.

1.—Tender copal, 7½ oz.; camphor, 1 oz.; alcohol of 95%, 1 qt. Dissolve, then add mastic, 2 oz.; Venice turpentine, 1 oz. Dissolve and strain. Very white, drying, and capable of being polished when hard. Used for toys.

2.—Sandarac, 8 oz.; mastic, 2 oz.; Canada balsam, 4 oz.; alcohol, 1 qt. Ninety per cent. alcohol, 1 qt.; gum sandarac, 10 oz.; gum mastic, 2 oz.; gum anime, ½ oz. Dissolve in a clean can, with gentle heat. Agitate well when the gums are dissolved; strain through a lawn sieve.

3.—Susceptible to polish for jambs, linets, etc. Mastic, in drops, 12 to 13 dkgrm.; sandarac, 48 to 49 dkgrm.; elemi, 6 dkgrm.; Venetian turpentine, 2 l.; alcohol, 2.

4.—*Soft White Varnish*.—Methylated spirit, 160 fl.oz.; sandarac rosin, 24 oz.; gum elemi, 16 oz.; anime rosin, 4 oz.; camphor, 2 oz.

#### Wicker Wagon Bodies. (See also Baskets.)

1.—Bleached shellac, 12 kgrm.; light manilla copal, 18 kgrm.; thick turpentine, 12 kgrm.; and 45 kgrm. of spirit.

2.—With 6 kgrm. orange shellac take 24 kgrm. of manilla copal (medium), 12 kgrm. thick turpentine, 1 kgrm. of castor oil and 45 kgrm. of spirit.

#### Wood.

1.—Linseed oil, 75 dkgrm.; amber, 50 dkgrm.; pulverized litharge, 16 dkgrm.; pulverized red lead, 92 dkgrm. This varnish, well applied, resists the action of boiling water.

2.—*White Woods*.—Dissolve 3 lb. of bleached shellac in 1 gal. 90% alcohol; strain, and add 1½ more gal. of 90% alcohol. If the shellac is pure and white, this will make a beautifully clear covering for white wooden articles.

### WHITEWASH.

1.—Lime, clean and well burnt, 6 qt.; Spanish whiting, or powdered burnt alum, 4 oz.; white sugar, 16 oz.; rice flour, 3 pt.; glue, of good quality, 16 oz.; water,

### (Whitewash)

boiling, 5 gal. Slake lime in vessel about 10 gal. capacity, with hot water, keeping vessel covered to retain the steam, and pass through a sieve to clear of coarse particles. Make up the rice flour to a thick paste and boil well, and dissolve the glue in water over a water bath; then mix the liquids with the remainder of the water, and add the whiting or alum and the sugar. The mixture should be applied warm on outdoor surfaces, and cold indoors.

2.—A good durable whitewash is made as follows: Take ½ bushel of freshly burnt lime, slake it with boiling water; cover it during the process, to keep in the steam. Strain the liquid through a fine sieve, and add to it 7 lb. of salt previously well dissolved in warm water; 3 lb. of ground rice boiled to a thin paste and stirred in boiling hot; ½ lb. of powdered Spanish whiting, 1 lb. of clean glue, which has been previously dissolved by soaking it well, and then hanging it over a slow fire in a small kettle, within a large one filled with water. Add 5 gal. of hot water to the mixture, stir it well, and let it stand a few days covered from dirt. It must be put on quite hot. For this purpose it can be kept in a kettle on a portable furnace. About 1 pt. of this mixture will cover a square yard.

3.—Paris white, 500 parts; zinc white, 100 parts; plaster of paris, 100 parts; white dextrine, 30 parts; gum arabic, 16 parts; borax, 9½ parts; ammonia, 9½ parts. Put up in pound packets, and direct a pint of boiling water to be added to the contents of a packet, the mixture afterwards to be thinned with cold water to a suitable consistency. Tinting is managed by adding a proportion of various ochers until the right shade is obtained.

4.—*To Color and Prevent Chalkiness from Rubbing Off*.—Give the desired color by adding small quantities of lampblack, brown ochre, ochre, or other coloring material. Add alum to fine whitewash to prevent rubbing off.

5.—*Damp Walls*.—For brickwork exposed to damp, take half a peck of well burned quicklime, fresh from the kiln, slake with hot water sufficient to reduce it to a paste, and pass it through a fine sieve; add a gallon of clean white salt which has been dissolved in a small quantity of boiling water, and a thin, smooth paste, also hot, made from 1 lb. of fine rice flour; also ¼ of a lb. of the best white glue, made in the water bath. Mix together, stir well, add ¼ of a lb. of best Spanish whiting in 5 qt. of boiling water; stir, cover to retain heat and exclude dust,

## Paints, Varnishes, Etc.

### (Whitewash)

and let it stand a week. Heat to boiling, stir, and apply hot. The above proportions will cover forty square yards.

6.—*Fences, etc.*—a.—White lime,  $\frac{1}{2}$  bushel; hydraulic cement, 3 pecks; umber and ochre, each 10 lb.; Venetian red, 1 lb.; lampblack,  $\frac{1}{4}$  lb.; slake the lime, shake up the lampblack with a little vinegar, mix well together, add the cement, and fill the barrel with water. Let it stand several hours; stir frequently. A larger proportion of ochre gives a darker color. Use only 1 coat. This is said to look well after five years' use.

b.—Slake the lime in boiling water. To  $\frac{1}{2}$  gal. ordinary whitewash add  $\frac{1}{2}$  pt. molasses and  $\frac{1}{2}$  pt. table salt. Stir frequently while applying.

c.—Quicklime,  $\frac{1}{4}$  bu.; slake, add  $\frac{1}{2}$  lb. common salt;  $\frac{1}{4}$  lb. sulphate of zinc (white vitriol); 2 qt. sweet milk. Dissolve the salt and white vitriol before adding. Mix with sufficient water to give the proper consistency. Apply as soon as possible.

7.—*Government Whitewash.* The following coating for rough brick walls is used by the U. S. government for painting lighthouses, and it effectually prevents moisture from striking through: Take of fresh Rosendale cement, 3 parts, and of clean, fine sand, 1 part; mix with fresh water thoroughly. This gives a gray or granite color, dark or light, according to the color of the cement. If brick color is desired, add enough Venetian red to the mixture to produce the color. If a very light color is desired, lime may be used with the cement and sand. Care must be taken to have all the ingredients well mixed together. In applying the wash, the wall must be wet with clean fresh water; then follow immediately with the cement wash. This prevents the bricks from absorbing the water from the wash too rapidly, and gives time for the cement to set. The wash must be well stirred during the application. The mixture is to be made as thick as can be applied conveniently with a whitewash brush. It is admirably suited for brickwork, fences, etc., but it cannot be used to advantage over paint whitewash.

8.—*Imcombustible.*—a.—Slake stone lime in a large tub or barrel with boiling water, covering the tub or barrel to keep in all the steam. When thus slaked pass 3 qt. of it through a fine sieve. It will then be in a state of fine flour. Now, to 6 qt. of this lime add 1 qt. of rock or Turk's Island salt and 1 gal. of water; then boil the mixture and skim it clean. To every 5 gal. of this skimmed mix-

### (Whitewash)

ture add 1 lb. of alum,  $\frac{1}{2}$  lb. of copperas; by slow degrees, add  $\frac{3}{4}$  lb. of potash and 4 qt. of fine sand or hickory ashes, sifted. We suppose any kind of good hard wood ashes will answer as well as hickory. This mixture will now admit of any coloring matter you please, and may be applied with a brush. It looks better than paint, and is as durable as slate. It will stop small leaks in the roof, prevent the moss from growing over and rotting the wood, and render it incombustible from sparks falling upon it. When laid upon brick work, it renders the brick impervious to rain or wet.

b.—Well wash the ceiling by wetting it twice with water, laying on as much as can well be floated on, then rub the old color up with a stumpy brush and wipe off with a large sponge. When this is done, stop all the cracks with whitening and plaster of paris. When dry, charge with size and a little of the whitewash. If very much stained, when this is dry, paint those parts with turps, color, and, if necessary, charge again. To make the whitewash, take 12 lb. of whitening (in large balls), break them up in a pail, and cover with water to soak. During this time melt over a slow fire 4 lb. of common size, and at the same time, with a palette knife or small trowel, rub up fine about 1 dessert-spoonful of blue black with water to a fine paste; then pour the water off the top of the whitening, and with a stick stir in the black; when well mixed, stir in the melted size, and strain. When cold it is fit for use. If the jelly is too stiff for use, heat it well up and add a little cold water. Commence whitewashing over the window, and so work from the light; lay off the work into that done, and not all in one direction, as in painting. Distemper color of any tint may be made by using any other color instead of the blue black—as ochre, chrome, Dutch pink, raw sienna for yellows and buff; Venetian red, burnt sienna, Indian red, or purple brown for reds; celestial blue, ultramarine, indigo for blues; red and blue for purple, gray or lavender; red lead and chrome for orange; Brunswick green for greens.

9.—*Keeping Whitewash.*—Keep the lime covered with water in a covered tub. If the water evaporates, the lime is useless, but if kept covered it will be good for a long time.

10.—*Rubbing Off, To Prevent.*—Mix  $\frac{1}{2}$  pt. flour with water; pour on boiling water enough to thicken it. Pour while hot, into a pailful of lime and water, which

## Paints, Varnishes, Etc.

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### (Whitewash)

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has been mixed ready to put on the wall. Stir all well together.

11.—*Waterproof.* Resenchek, of Munich, mixes together the powder from 3 parts of silicious rock (quartz), 3 parts broken marble and sandstone, also 2 parts of burned porcelain clay, with 2 parts of freshly slaked lime, still warm. In this way a wash is made which forms a silicate if often wetted, and becomes, after a time, almost like stone. The four constituents, mixed together, give the ground color, to which any pigment that can be used with lime is added. It is applied quite thickly to the wall or other surface, let dry one day, and the next day frequently covered

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### (Whitewash)

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with water, which makes it waterproof. This wash can be cleansed with water without losing any of its color; on the contrary, each time it gets harder, so that it can even be brushed, while its porosity makes it look soft. The wash, or calcimine, can be used for ordinary purposes, as well as for the finest painting. A so-called fresco surface can be prepared with it in the dry way.

12.—*Zinc Whitewash.*—Common size mixed with oxide of zinc; apply to the ceiling with a brush. Then apply a wash of chloride of zinc. This will combine with the oxide, and form a smooth cement, with a glossy surface.

## CHAPTER XX

### PHOTOGRAPHY

#### BRIEF SCHEME OF CLASSIFICATION

WET COLLODION, COLLODION EMULSION AND DRY COLLO- DION FERROTYPES	PRINTING PROCESSES ( <i>Continued</i> )
DEVELOPERS FOR PLATES	FERRO-PRUSSIAN, ETC.
FIXING, HARDENING AND CLEAR- ING	PLATINUM AND KINDRED PROC- ESSES
INTENSIFIERS AND REDUCERS	CARBON PRINTING
VARNISHES	OZOTYPE, OZOBROME, CARBO- GRAPH AND KINDRED PROC- ESSES
STRIPPING	MISCELLANEOUS PRINTING PROCESSES
RETOUCHING AND SPOTTING NEGATIVES	CERAMIC ENAMELS
PRINTING PROCESSES:	LANTERN SLIDES
PAPERS FOR SENSITIZING	SPOTTING, COLORING PRINTS, ETC.
HOME-MADE PAPERS, SILVER PAPERS, PLAIN SALTED, ETC.	MOUNTANTS AND MOUNTING
SENSITIZING FABRICS, ETC.	ORTHOCHROMATIC PHOTOGRA- PHY
GELATINE PRINTING OUT PAPER	PHOTO-MECHANICAL PROCESSES:
COLLODION PRINTING OUT PAPER	LIGHT, FILTERS, ZINC, HALF- TONE, COLLOTYPE, PHOTO- GRAVURES, ETC.
BROMIDE PAPERS, ETC.	ARTIFICIAL LIGHT
GASLIGHT PAPERS	

This subject is divided into sections containing related formulas. No attempt has been made to give a general treatise on photography or special modes of treatment of plates and papers when specific directions accompany each package. Occasional exceptions have been made for the newer or rarer processes. Thanks are especially due in this chapter to the English annuals, which still keep up the time-honored process of having scores of pages of tested formulas as did our American annuals of photography at one time. The Index will bring the reader into instant touch with all the formulas.

#### WET COLLODION, COLLODION EMULSION AND DRY COLLODION

##### Wet Collodion.

*Substratum.*—Swell gelatine (22 gr.) in part of 20 oz. of water for 15 minutes, place vessel in boiling water, add the rest of the water, and finally ammonia (.880), 40 min. Pour over plates three times, draining after each, and set to dry. Mix as required. Or, White of 1 egg; water, 20 oz. Or, Dried albumen, 50 gr.; water, 50 oz.; ammonia, 5 drops. Or, Gelatine, 75 gr.; water, 60 oz.; ammonia, 2 dr. Or, Gelatine, 50 gr.; glacial acetic acid, 4 dr.; alcohol, 6 dr.; chrome alum, 10 gr.;

water, 60 oz. Or, Hard gelatine, 1 gram; water, 300 c.c.; chrome alum solution (20%), 6 c.c. Or, Pure Para rubber, 50 gr.; benzole, 20 oz. Or, Plates may be dusted with talc, which is then carefully cleaned off, to leave no marks.

*Edging.*—Pure rubber cut small, 20 gr.; benzole, 5 oz. Place in a clean dry bottle and shake with benzole; or, rubber paste, 25 gr.; benzole, 5 oz.; or, if rubber edging gives fog, use white of egg.

*Varnishing.*—Coat drained negative with gum arabic, 2 oz.; water, 20 oz. Or, White of 1 egg, plus water, 20 oz., and dry. Or, Shellac spirit varnish on the dry negative.

*Pyroxyline* (Hardwich).—Sulphuric

**Always consult the Index when using this book.**

## Photography

### (Wet Collodion)

acid, 1.845, 18 fl.oz. (600 c.c.s.); nitric acid, 1.457, 6 fl.oz. (200 c.c.s.); water, 5 to 5½ fl.oz. (167 to 182 c.c.s.); cotton-wool, 300 gr. (23 grams). Temperature, 150° F. (65° C.). Time of immersion, 10 minutes.

**Iodized Collodion.**—For Acid Pyro-Developer.—Ether, sp. gr. 0.725, 10 fl.oz. (1,000 c.c.s.); alcohol, sp. gr. 0.805, 1 fl.oz. (100 c.c.s.); pyroxyline, 120 gr. (27 grams); ammonium iodide, 30 gr. (7 grams); cadmium iodide, 45 gr. (10 grams); alcohol (0.830), 4 fl.oz. (400 c.c.s.).

**Bromo-Iodized Collodion.**—For Iron Developer.—Ether, sp. gr. 0.725, 10 fl.oz. (1,000 c.c.s.); alcohol, sp. gr. 0.805, 5 fl.oz. (500 c.c.s.); pyroxyline, 120 gr. (27 grams); ammonium iodide, 40 gr. (9 grams); cadmium iodide, 40 gr. (9 grams); cadmium bromide, 20 gr. (4.5 grams); alcohol (0.830), 5 fl.oz. (500 c.c.s.). Thinning collodion after use. A mixture of sulphuric ether (0.729), 3 parts, and alcohol (0.805), 2 parts, is generally used.

**The Nitrate Bath.** Silver nitrate, 6 oz. (75 grams); distilled water, 80 fl.oz. (1,000 c.c.s.); nitric acid (pure), 8 min. (0.2 c.c.s.). Saturate with iodide of silver, which may be done by coating a plate with collodion and leaving it in the bath for some hours. Filter.

**Developer.** No. 1: Ferrous sulphate, ½ oz. (50 grams); glacial acetic acid, ½ oz. (50 c.c.s.); alcohol, ½ oz. (50 c.c.s.); water, 10 oz. (1,000 c.c.s.). No. 2: Ferrous ammonio-sulphate, 75 gr. (43 grams); glacial acetic acid, 75 gr. (43 grams); copper sulphate, 7 gr. (4 grams); water, 1 oz. (1,000 c.c.s.); alcohol, 1 oz. (60 c.c.s.).

**Intensifier.** Pyrogallie acid, 90 gr. (40 grams); citric acid, 60 gr. (7 grams); acetic acid (glacial), 1 oz. (50 c.c.s.); water, 20 oz. (1,000 c.c.s.). The copper intensifier (see INTENSIFIERS) is used for greater density, each solution being flowed over the plate with a rinse between.

### Positives and Ferrotypes by Wet Collodion.

**Bromo-Iodized Collodion.** Ether, sp. gr. 0.725, 10 fl.oz. (1,000 c.c.s.); alcohol, sp. gr. 0.805, 5 fl.oz. (500 c.c.s.); pyroxyline, 100 gr. (23 grams); cadmium iodide, 50 gr. (11½ grams); ammonium bromide, 25 gr. (5.5 grams); alcohol, 0.830, 5 fl.oz. (500 c.c.s.). Note.—The iodides should be dissolved in the weaker spirit, and the pyroxyline in the ether and stronger spirit, and the two solutions mixed.

### (Collodion Emulsion)

**Silver Bath.**—Silver nitrate (recryst.), 5½ oz. (70 grams); distilled water, 80 fl.oz. (1,000 c.c.s.); nitric acid (pure), ½ dr. (0.8 c.c.). Saturate with iodide of silver and filter as above.

**Developers.** Ferrous sulphate, 150 gr. (34 grams); glacial acetic acid, ½ oz. (50 c.c.s.); nitric acid, 5 min. (1 c.c.); alcohol, ½ oz. (50 c.c.s.); water, 10 oz. (1,000 c.c.s.). Note.—By increasing the proportion of nitric acid and decreasing that of the acetic, the image will be more metallic in appearance.

**Nitrate of Iron Developer.** Ferrous sulphate, 1½ oz. (75 grams); barium nitrate, 1 oz. (50 grams); water, 20 oz. (1,000 c.c.s.); alcohol, 1 oz. (50 c.c.s.); nitric acid, 40 drops (4 c.c.s.). The insoluble barium sulphate which is formed must be filtered out.

**Firing Solution.** Potassium cyanide, ½ oz. (25 to 30 grams); water, 15 to 20 oz. (1,000 c.c.s.).

**Developer for Collodion Transfers.**—Pyrogallie acid, 4 gr. (9 grams); citric acid, 3 gr. (7 grams); acetic acid, 20 min. (41 c.c.s.); water, 1 oz. (1,000 c.c.s.); alcohol, 20 min. (41 c.c.s.).

### Wet Collodion for Half-Tone.

**For Winter.** a. Collodion, 190 gr. (21 grams); ether (720), 12 oz. (600 c.c.s.); alcohol (800), 8 oz. (400 c.c.s.).

**For Summer.** b. Collodion, 190 gr. (21 grams); ether (720), 10 oz. (500 c.c.s.); alcohol (805), 10 oz. (500 c.c.s.).

**Iodizer.** Cadmium iodide, 600 gr. (168 grams); ammonium iodide, 210 gr. (24 grams); sodium iodide, 210 gr. (24 grams); cadmium bromide, 210 gr. (24 grams); alcohol, 20 oz. (1,000 c.c.s.). Use iodizer, 1 part; collodion, 15 parts, and set the mixture aside for at least 4 days to ripen. It should then be a bright yellow; if not, add to each ounce 1 min. of a solution of iodine, 16 gr.; alcohol, 1 oz.

### Collodion Emulsion.

**Pyroxyline for Collodio-Bromide or Unwashed Emulsion.**—Nitric acid, sp. gr. 1.45, 2 fl.oz. (285 c.c.s.); sulphuric acid, sp. gr. 1.845, 4 oz. (570 c.c.s.); water, 1 fl.oz. (115 c.c.s.); cotton (cleaned and carded), 100 gr. (23 grams). Temperature, 150° F. (65° C.). Time of immersion, 10 minutes.

**Collodio-Bromide Emulsion.**—Ether, sp. gr. 0.720, 5 fl.oz. (620 c.c.s.); alcohol, sp. gr. 0.820, 3 oz. (380 c.c.s.); pyroxyline, 50 gr. (14.3 grams); cadmium ammonium bromide, 80 gr. (23 grams), or zinc bromide, 76 gr. (21.5 grams). Sensitize

## Photography

### (Collodion Emulsion)

by adding to each ounce 15 gr. of nitrate of silver dissolved in a few drops of water and 1 dr. of boiling alcohol. This is suitable for slow landscape work or for transparencies.

**Washed Emulsion (for Transparencies).**—Ether, sp. gr. 0.720, 5 fl.oz. (620 c.c.s.); alcohol, sp. gr. 0.820, 3 oz. (380 c.c.s.); pyroxyline or papyroxyline, 60 gr. (17 grams); cadmium ammonium bromide, 100 gr. (20 grams), or zinc bromide, 96 gr. (27.5 grams); hydrochloric acid, sp. gr. 1.2, 8 min. (2 c.c.s.). Sensitize with 20 gr. of silver nitrate to each ounce (4.3 gr. to each 100 c.c.s.), dissolved in a minimum of water with 2 dr. (13 c.c.s.) of boiling alcohol. Allow to stand for 2 or 3 days. In the last formula the emulsion, after being allowed to ripen for the time stated, should be poured into a dish and allowed to become thoroughly dry. The mass of dry emulsion is then washed to remove all the soluble salts, and is then again dried and redissolved in equal parts of ether and alcohol at the rate of from 20 to 24 gr. to the ounce of solvents.

**Developer.**—An excellent developer for collodion emulsion is the following, worked out by the Bolt Court School of Photo-Engraving, London: Glycin, 130 gr. (17 grams); sodium sulphite, 1 oz. (40 grams); potass. carbonate, 2 oz. (80 grams); water to 25 oz. (1,000 c.c.s.).

**Intensifying Solution for Collodion Emulsion.**—Silver nitrate, 60 gr. (70 grams); citric acid, 30 gr. (35 grams); nitric acid, 30 min. (35 c.c.s.); water, 2 oz. (100 c.c.s.). To each dram of a three-grain solution of pyrogalllic acid add 2 or 3 minims of the above and apply until sufficient density is attained.

**Hull's Chlor-Bromide Collodion Emulsion.** Special for Color Work.—a.—Silver nitrate, 480 gr. (50 grams); hot distilled water, 1 oz. (50 c.c.s.). Dissolve and add alcohol, 2 oz. (100 c.c.s.); nitric acid, 6 drops (10 drops). Shake well and add to 4% collodion, 10 oz. (500 c.c.s.). Shake till any precipitated pyroxyline is redissolved and then add in small quantities zinc bromide (pure anhydrous), 307 gr. (32 grams); absolute alcohol, 2½ oz. (128 c.c.s.). Shaking between each addition, then add nitric acid, 24 min. (1.5 c.c.s.); hydrochloric acid, 24 min. (1.5 c.c.s.). This should be gently warmed before adding to the collodion. Allow to stand for 24 to 36 hours, or till the emulsion appears a grayish-violet by transmitted light, then add zinc chloride (pure anhydrous), 77 gr. (3.2 grams), or sufficient to convert the whole of the uncombined

### (Time Development)

silver nitrate into chloride, which can be tested for with potassium chromate. It is advisable to dissolve the zinc chloride in about 4 times its volume of acid. The emulsion should then be precipitated by pouring into plenty of water, the threads collected and shaken up with alcohol and drained and then dissolved in absolute alcohol, 10 oz. (500 c.c.s.); ether, washed, 10 oz. (500 c.c.s.).

#### DEVELOPERS FOR DRY PLATES

Developers for photographic papers will be found further on.

#### Standard Development Formulæ.

In grains per ounce of water as applied to plate. By reading every grain as 2 grains, every minim as 2 c.c.s. and the ounce as 1,000 c.c.s. (1 l.) these become metric formulæ.

The following formulæ are those adopted as standards for "Tabloid" preparations:

**Paramidophenol**, 2 gr.; soda sulphite, 6 gr.; sodium hydrate, 4 gr.; potass. bromide, ¼ gr.

**Amidol**, 2 gr.; soda sulphite, 22 gr.; potass. bromide, 1 gr.

**Eikonogen**, 4 gr.; soda sulphite, 28 gr.; potass. carbonate cryst., 7½ gr.; potass. bromide, ½ gr.

**Metol-Hydroquinone**.—Metol, ¾ gr.; hydroquinone, 1½ gr.; soda sulphite, 5½ gr.; soda carbonate cryst., 13½ gr.; potass. bromide, ¼ gr. For gaslight papers use twice this strength.

**Glycin**, 2 gr.; soda sulphite, 5 gr.; potass. carbonate cryst., 12.6 gr.

**Pyro-Soda**. Pyro, 2 gr.; sodium sulphite, 12 gr.; soda carbonate cryst., 13½ gr.; potass. bromide, ½ gr.

**Pyro-Soda**. Pyro, 2 gr.; sodium sulphite, 22 gr.; soda carbonate cryst., 22 gr.; potass. bromide, ½ gr.

**Hydroquinone**, 2 gr.; soda sulphite, 6 gr.; sodium hydrate, 4 gr.; potass. bromide, ¼ gr.

**Metol**, 2 gr.; soda sulphite, 22 gr.; soda carbonate cryst., 13 gr.; potass. bromide, ¾ gr.

**Ortol**, 2 gr.; soda sulphite, 16 gr.; soda carbonate cryst., 16¼ gr.; potass. bromide, ¼ gr.

Satropol may be substituted for "metol."

#### Factor or Time Development.

**Principle.**—With correct exposure, the total time of development for a certain density has a fixed relation to the time of appearance of image, provided that the developing power of the solution remains

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## (Time Development)

constant during development, and this rule holds good for all variations of strength, amount of alkali or bromide, and temperature within those limits which have been found safe in practice.

The total time of development, divided by the time in which the image first appears, is the "factor" of the developer. Metal is a "long factor" developer, i.e., a plate must be developed for, say, 30 times the time of first appearance. If less, a soft negative is obtained. Hydroquinone is a "short factor" developer, easily producing too much contrast by over-development. Factors for average vigor: Adinol, 5; azol, 30; certinal, 30; cristoid pyrocatechin, 30; diogen, 12; edinol, 20; eikonogen, 9; glycin-potash, 12; glycin-soda, 8; hydroquinone (usual dose of bromide), 5; imogen sulphite, 6; kachin, 10; kodak powder, 18; moquin, 12; metol, 30; metol-hydroquinone, 14; ortol, 10; paramidophenol, 16; pyrocatechin, 10; pyrometol (imperial standard), 9; pyro-soda, 4 to 15; quinomet, 30; rodinal, 30; synthol, 30; victol, 30.

*Factors for Soft, Normal and Strong Contrast, with "Tabloid" Formulae, from the Burroughs-Wellcome Cards.* Amidol, 7, 10, 12; edinol, 14, 20, 24; eikonogen, 8, 12, 15; glycin, 9, 13, 16; hydroquinone, 3, 4½, 5; metol, 20, 30, 35; metol-hydroquinone, 10, 14, 16; paramidophenol, 12, 16, 18; pyro, 4, 6, 7; pyro-metal, 6, 9, 11. *Factors for Pyro-Soda and Pyro-Potash (with or without bromide).*

Pyro. gr. per oz.	Bromide, gr. per oz.	Factor.
1	$\frac{1}{4}$	9
2	$\frac{1}{2}$	5
3	$\frac{3}{4}$	4½
4	1	4
8	2	3¼
1	0	18
2	0	12
3	0	10
4	0	8
5	0	6½

*Controlled Factorial Development.*—To make suitable negatives for any particular printing process observe the time of appearance of the image (Watkins), then

## (Time Development)

with the standard developer given below develop for a negative to print on P.O.P. 12 times the time of first appearance; for enlarging, 8 times; for carbon printing, 10 times; for platinotype printing, 18 times. Developer: Sodium sulphite solution (25%), 1½ oz.; water (distilled), 6 oz.; potassium bromide solution (10%), 60 min.; amidol, 18 gr. Amidol to be added only just before use.

*Pyro-Metol.*—*Mean of Makers' Formulae.* Pyro, 1.44 gr.; metol, 1.14 gr.; sodium sulphite, 15 gr.; potassium metabisulphite, 2 gr.; sodium carbonate, 34.5 gr.; potassium carbonate, 0.5 gr.; water, 1 oz.

*Pyro-Potash.*—a.—Pyro, 440 gr.; soda sulphite, 1,110 gr.; sulphuric acid, 10 to 12 drops; water, 10 oz. b.—Potass. carbonate, 2,000 gr.; soda sulphite, 550 gr.; water, 10 oz. a, 45 min.; b, 45 min.; water, 3½ oz.—*Eder.*

*Pyro-Soda.*—*Hurter & Driffeld Standard.* Pyro, 77 gr.; sodium carbonate, 384 gr.; sodium sulphite, 384 gr.; distilled water to 20 oz. *Mean of Makers' Formulae.*—Pyro, 3 gr.; sodium sulphite, 22 gr.; sodium carbonate, 22 gr.; potassium bromide, 0.4 gr.; water, 1 oz.

Estimated Factors for American Pyro-Soda Developers.—Seed A. B. C. (no Br.), 11; seed pyro (no Br.), 11; Stanley (no Br.), 10; Cramer (max. str.), 6½; Cramer (min. str.), 11; Hammer (no Br.), 11; Eastman (no Br.), 12.

*Pyrocatechin.*—a.—Pyrocatechin, 90 gr.; soda sulphite cryst., 1 oz.; water, 10 oz. b.—Caustic soda, 55 gr.; water, 10 oz. a, 1 oz.; b, 1 oz.; water, 2 to 6 oz.

*Rodinal* (liquid para-amido-phenol).—For average work, dilute 1 oz. with 25 oz. water. For density in moderate time, 1 in 10. For over-exposure, 1 in 10 to 15, and add potass. bromide. For under-exposure, 1 in 30 to 40 or 50.

*Rytol*, one tabloid; accelerator, one tabloid; water, 4 oz.

The quantities in the first column represent those required in a flat-bottomed dish. As most dishes have ridges or depressions on the bottom to facilitate lift-

Plate.	Size of dish.	To cover plate in flat dish.		Usually required to develop.	
		c.c.	oz.	c.c.	oz.
4¼ × 3¼	4½ × 3¾	20	$\frac{2}{3}$	45	1½
5½ × 3½	6 × 4	30	1	60	2
(5 × 4)					
6½ × 4½	7 × 5	40	1½	90	3
8½ × 6½	9 × 7	80	2½	150	5

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### (Developers)

ing the plate, the second column gives quantity to cover a plate in such dishes. Thickness of plate used,  $1\frac{1}{2}$  mm.

**Temperature as Accelerator or Restraint.**—When known over or under-exposure exists, heat (up to  $85$  to  $90^{\circ}$  F.) and cold (down to  $40^{\circ}$  F.) may be used most efficiently to accelerate and to restrain respectively. A water-bath, a little ice and a thermometer used with care will give as much control as a whole shelf full of chemicals.

**Formalin and Forced Development for Under-Exposure.**—When very great under-exposure is known, soak the plates in a weak solution of formalin for 15 minutes, then wash well. Develop in a dilute metol developer, heated to  $120^{\circ}$  F. This method seems to work with only certain brands of plates, and it requires the greatest possible care to avoid fog, either in the camera or dark room, as the forced development intensifies the fog considerably.

**Negative Paper, Developer for.**—Use amidol, edinol, glycin, metol hydroquinone or ortol. Fix in acid hypo.

**Powder Developer** (for cartons, tablets, etc.).—a.—Metol, 15 gr.; hydroquinone, 40 gr.; eikonogen, 25 gr.; boric acid, 10 gr.; sodium sulphite (anhydrous), 20 gr. b.—borax, 25 gr.; sugar of milk, 25 gr. To use, take a,  $2\frac{1}{2}$  oz.; b,  $\frac{1}{2}$  oz.; water, 10 oz.

**Thickened Developer.**—Said to give negatives with fine grain, softness and freedom from halation. Add 1 oz. of golden syrup (molasses) to every 2 oz. of developer. This will increase the time of development about 50%. Dish requires constant rocking. A developer specially recommended for this method is: Metol, 3 gr.; hydroquinone, 12 gr.; sodium carbonate cryst., 100 gr.; sodium sulphite cryst., 50 gr.; molasses, 2 oz.; water, 4 oz.

### Developers by Name.

**Adurol.**—a.—Adurol, 85 gr.; soda sulphite,  $1\frac{1}{2}$  oz.; water, 10 oz. b.—Potassium carbonate,  $1\frac{1}{4}$  oz.; water, 10 oz. For studio work and snapshot, a, 1 oz.; b, 1 oz. For time exposures outdoor, a, 1 oz.; b, 1 oz.; water, 1 oz. One solution.—Soda sulphite, 4 oz.; potass. carbonate, 3 oz.; water, 10 oz. When all are dissolved, add adurol,  $\frac{1}{2}$  oz. For studio and snapshots, take 1 oz. and 3 oz. water. For time exposures outdoor, take 1 oz. with 5 oz. water. Develops quicker and is less affected by cold than hydroquinone.

**Amidol, To Keep.**—Papazoglou recommends 80% sugar syrup, made by taking 8 oz. white sugar, about 2 oz. water, boil-

### (Developers)

ing, and making up to 10 oz. with water. His formula for developer is: Sodium sulphite, 270 gr.; amidol, 70 gr.; sodium bisulphite lye, 6 oz.; sugar, 80% syrup, 6 oz.; rectified spirit, 4 oz.; water to 20 oz. This will have some of the advantages of the "thickened" developer.

**Azol**, 20 min.; water, 1 oz.

**Catechol.**—Catechol (pyrocatechin) gives clear, good printing negatives with less density and no greater detail for a given exposure than pyro or quinol, but, has the advantage that it works well in dilute solutions. The following formula is given: (a) Caustic potash, 10 parts; water, 1,000 parts. (b) Catechol, 2 parts; sodium sulphite, 10 parts; water, 100 parts. Mix 5 parts of both with 100 parts of water, and, if necessary, add potassium bromide. The two solutions may be kept ready mixed.

**Certinal.** Normal exposures.—Certinal, 1 part; water, 20 parts. Under-exposure.—Certinal, 1 part; water, 30 parts. Over-exposure.—Certinal, 1 part; water, 10 to 15 parts; potassium bromide (10% sol.), 1 part.

**Diamidophenol.**—(See Amidol.)

**Diamine** (Lumière's *Diamido-recorcin*).—Diamine,  $\frac{1}{2}$  oz.; soda sulphite (anhydrous),  $1\frac{1}{2}$  oz.; water, 50 oz. For over-exposure add 10% potass. bromide; for under-exposure use more sulphite.

**Dianol** (Lumière's *Diamido-phenol*).—Dianol, 110 gr.; soda sulphite (anhydrous),  $1\frac{1}{2}$  oz.; water, 50 oz. Does not keep.

**Edinol.**—For Soft Portrait Negatives.—Edinol, 45 gr.; soda carbonate cryst., 1 oz.; soda sulphite, 1 oz.; water, 10 oz. For Snapshots.—Edinol, 45 gr.; acetone-sulphite (Bayer), 140 gr.; potassium carbonate, 1 oz.; potassium bromide, 20 gr.; water, 10 oz.

**Eikonogen** (One Solution).—Eikonogen, 100 gr.; soda sulphite, 200 gr.; potassium bromide, 2 gr.; soda carbonate, 200 gr.; water, 9 oz. Without bromide gives softer negatives. Two Solutions.—(a) Soda sulphite, 350 gr.; eikonogen, 110 gr.; water, 10 oz. (b) Potassium carbonate, 530 to 600 gr.; water, 20 oz. Use equal parts.

**Eikonogen-Hydroquinone.**—(a) Hydroquinone, 40 gr.; eikonogen, 150 gr.; sodium sulphite,  $2\frac{1}{2}$  oz.; water, 20 oz. (b) Sodium carbonate, 5 oz.; water, 20 oz. Equal parts.

**Ferrous Citro-Oxalate Developer.**—1.—Potassium citrate, 700 gr.; potassium oxalate, 200 gr.; water,  $3\frac{1}{4}$  oz.

2.—Ferrous sulphate, 300 gr.; water,  $3\frac{1}{4}$  oz. Mix in equal parts.



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3.—For black and white tones, develop with ferrous oxalate. The following is the formula: Oxalate Solution—Neutral oxalate of potash, 1 oz.; bromide of potassium, 2½ gr.; hot distilled water, 5 oz. Iron Solution—Pure proto-sulphate of iron, 2 dr.; hot distilled water, 2 oz. To develop mix together 2 parts of oxalate solution with 1 part of iron solution and pour in 1 wave across the plate. Rock well during development, which it is advisable to continue as long as detail is visible in the high lights of the picture. Rinse well after development and previous to fixing. The fixing solution should be of the strength of 1 oz. in 4 oz. of water. The hyposulphite of soda solution should not be mixed till required, as a trace of this salt in the developing bath is ruinous.

4.—The following oxalate developer is said to keep well:

a.—Citric acid, 1 oz.; citrate of ammonium, 1 oz.; chloride of ammonium, 1 dr.; bromide of ammonium, 1½ dr.; oxalate of potash, 10 oz.; water, 50 oz.

b.—Protosulphate of iron, 3 oz. and 60 gr.; citric acid, 1 oz.; water, 50 oz. Mix in equal proportions.

*Glycin.*—Glycin, 50 gr.; potassium carbonate (cryst.), 5 dr.; sodium sulphite (cryst.), 5 dr.; water, 10 oz. Or (a), Hot water, 35 oz.; soda sulphite, 2½ oz.; glycin, ¾ oz. (b) Water, 35 oz.; potassium carbonate, 3½ oz. Equal parts.

*Glycin-Hydroquinone.*—(a) Glycin, 180 gr.; hydroquinone, 60 gr.; potassium carbonate, 180 gr.; sodium sulphite, 2 oz.; water (distilled, warm), to 10 oz. (b) Potassium carbonate, 1 oz.; distilled water, 9 oz. Take 1 part of (a) to 2 parts of (b). In all glycin formulae dissolve the glycin first.

*Hydramine (Lumière).*—Hydramine, 1½ oz.; soda sulphite (anhydrous), ¾ oz.; caustic lithia, 65 gr.; water, 50 oz. For over-exposure add 10% bromide; for under-exposure, 1% lithia solution.

*Hydroquinone.* Concentrated Stock Solution. (a) Hydroquinone, 480 gr.; alcohol, 3½ oz.; sulphurous acid, 3½ oz.; water to 20 oz. (b) Sodium hydrate, 480 gr.; sodium sulphite, 480 gr.; water to 20 oz. For use: 1 part each (a) and (b), 8 parts of water.

*Hydroquinone-Formalin.*—Hydroquinone, ½ oz.; soda sulphite, 5 oz.; formalin—Schering, ½ fl. oz.; water, 30 oz. Slow and stainless. Gives clear lines and great density. For black-and-white.

*Hydroquinone-Caustic.*—(a) Hydroquinone, 100 gr.; soda sulphite, 2 oz.; citric acid, 60 gr.; potassium bromide, 40 gr.; water, 20 oz. (b) Caustic soda (stick),

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160 gr.; water, 20 oz. (a) 1 oz.; (b) 1 oz.; water, 2 oz. Tends to give hard results. Suitable for black-and-white subjects.

*Imogen Sulphite.*—(a) Imogen sulphite, 1 oz.; water, 12 oz. (b) Soda carbonate cryst., 1 oz.; water, 2 oz. (a) 2 oz.; (b) 2 oz.; water, 4 oz. Under-exposures: (a) 1 oz.; (b) 3 oz.; water, 4 oz. Over-exposures: (a) 2 oz.; (b) 2 oz.; water, 3 oz.; potass. bromide (10% solution), 1 oz.

*Kachin Carbonate.*—(a) Kachin, 100 gr.; soda sulphite, 2½ oz.; water to 20 oz. (b) Soda carbonate cryst., 2 oz.; water to 20 oz. Equal parts. Dilute for softer results. To restrain add 10 to 30 drops 5% solution of ordinary borax per ounce.

*Kachin Caustic.*—With caustic soda: (a) Kachin, 140 gr.; soda sulphite, 700 gr.; water to 16 oz. (b) Caustic soda (stick), 98 gr.; water to 16 oz. (a) 1 oz.; (b) 1 oz.; water, 2 to 6 oz.

*Metal.*—(a) Water, 10 oz.; metal, 75 gr.; soda sulphite, 1¼ oz. (b) Water, 10 oz.; soda carbonate, 1¾ oz.; potassium bromide, 8 gr. For portraits: (a), 1 oz.; (b), 1 oz. For landscapes: (a), 1 oz.; (b), 1 oz.; water, 1 oz. Or, One Solution.—Water, 10 oz.; metal, 75 gr.; soda sulphite, 1¼ oz.; soda carbonate cryst., 1¼ oz.; potassium bromide, 8 gr. For portraits: Stock solution, 1 oz.; water, 1 oz. For landscapes: Stock solution, 1 oz.; water, 2 oz.

*Metal-Adural (Stock Solution).*—Dissolve in 8¼ oz. of water metal, 50 gr., and adural, 175 gr. Then add slowly soda sulphite cryst., 3 oz.; potassium carbonate, 2 oz., and potassium bromide, 9 gr. Filter. Take stock solution, 1 dr.; water, to 1¼ to 2 oz.

*Metal-Hydroquinone.*—1.—Metal, 40 gr.; hydroquinone, 50 gr.; soda sulphite, 120 gr.; potassium bromide, 15 gr.; water, 20 oz.

2.—Caustic potash, 180 gr.; water, 20 oz. Equal parts.

Single Solution.—Metal, ½ oz.; sodium sulphite (cryst.), 4 oz.; sodium carbonate (cryst.), 4 oz.; hydroquinone, 14 oz.; water, to 80 oz. Dilute with equal quantity of water for use. Dissolve in order named, not adding an ingredient until the previous one is dissolved completely.

*Developing Powders.*—A developer in powder form, suitable for taking on tours, is prepared as follows:

1.—Metal, 7 parts; hydroquinone, 18¼ parts; powdered alkonone, 10½ parts; powdered boric acid, 4½ parts. Mix this

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well and keep in a well stoppered yellow bottle.

2.—Sulphite of soda, 45 parts; borax,  $10\frac{1}{2}$  parts; sugar of milk,  $10\frac{1}{2}$  parts. This may be kept in a white bottle. For use take water, 100 parts; powder 1, 2 parts; powder 2, 4 parts. For bromide paper use double the amount of water.

*Metol-Hydroquinone: The Average.*—This developer is probably recommended by more manufacturers than is any other at present. A dozen of the most used formulae give the following average composition, which works very well: Metol,  $\frac{3}{4}$  gr.; hydroquinone, 3 gr.; sodium sulphite, 24 gr.; sodium carbonate, 36 gr.; potassium bromide,  $\frac{1}{4}$  gr.; water, 1 oz.

Three Solution (Metol, Hydroquinone or Metol-Hydroquinone if desired).—(a) Metol, 40 gr.; sodium sulphite, 120 gr.; water, 8 oz. (b) Hydroquinone, 40 gr.; citric acid, 10 gr.; water, 8 oz. (c) Potassium carbonate, 1 oz.; water, 20 oz. For metol developer take 1 part of (a) and 1 of (c); for hydroquinone, one of (b) and one of (c); for metol-hydroquinone, mix of (a) and (b) in proportions, according to effect desired, and add 1 part of the mixture to 1 part of (c).

*Highly Concentrated Stock.*—Warm water, 4 oz.; metol, 24 gr.; hydroquinone, 96 gr. When dissolved, add soda sulphite (crushed small),  $1\frac{1}{4}$  oz. By the time the sulphite has dissolved the whole will be a white pasty mass. Now add 64 gr. of sodium hydrate (caustic soda), shake well, and in a minute or so you will have a clear concentrated metol-hydroquinone solution. One dr. of this, added to 7 dr. of water will make a developer containing in each ounce: Metol,  $\frac{3}{4}$  gr.; hydroquinone, 3 gr.; sodium sulphite, 2 gr.; sodium hydrate, 2 gr. Can be used half strength for most purposes. The image appears in 5 to 8 seconds; development usually complete in  $1\frac{1}{4}$  or 2 minutes; factor about 16. Diluted 1 dr. to 2 oz. of water and 2 drops of bromide added to each ounce, it makes a first-rate bromide paper developer. The strong solution keeps very well indeed.

"M.Q." Developer is metol-hydroquinone. (Metol Quinol.)

*Monol.*—Slow bath—1 part monol, 7 parts water; time to develop normally exposed negative, 3 hours. Semi-rapid bath—monol, 1 part; water, 3 parts; time, 1 hour. Rapid bath—monol, 1 part; water, 1 part; time, 10 minutes.

*Ortol-Soda.*—(a) Ortol, 70 gr.; potassium metabisulphite, 35 gr.; cold water, 10 oz. (b) Soda carbonate,  $1\frac{1}{4}$  oz.; soda

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sulphite,  $1\frac{1}{4}$  oz.; water, 10 oz. (a), 1 oz.; (b), 1 oz.; water, 1 oz. Or (a), Ortol, 1 oz.; potassium metabisulphite,  $\frac{1}{2}$  oz.; water, 60 oz. (b) Sodium carbonate (cryst.), 12 oz.; sodium sulphite (cryst.), 8 oz.; water, 60 oz. Take 1 part each of (a) and (b) to 10 parts water. Soda sulphite should not be used to preserve ortol: it is apt to cause pink stain. Caustic alkalis are to be avoided for the same reason. Increase of (a) solution and decrease of (b) gives harder negatives; vice versa, softer negatives.

*Para-amido-phenol*, 150 gr.; potassium metabisulphite, 1 oz.; hot water,  $3\frac{1}{4}$  oz. Add caustic potash strong solution until the separated para-amido-phenol just disappears. A preparation similar to radical. Dilute with 10 to 30 parts water.

*Paranol (Lumière's Paramidophenol).*—Paranol, 350 gr.; soda sulphite (anhydrous), 3 oz.; caustic lithia, 70 gr.; water, 17 oz.

*Phenolin.* Water, 10 oz.; sodium sulphite,  $\frac{1}{2}$  oz.; phenolin, 12 gr.; potassium bromide, 7 gr. Dissolve in this order.

*Pyramidol.*—(a) Sodium sulphite,  $1\frac{1}{2}$  oz.; pyramidol, 90 gr.; water, 20 oz. (b) Potassium carbonate, 1 oz.; water, 29 oz. For use mix in equal parts. This is a new developing agent prepared in Switzerland.

*Pyro. Preservatives for.*—The best preservative for pyro developers is liquid soda bisulphite: 2 or 4 c.c. to the liter of developer, or 1 to 2 drops to the ounce.

*Pyro. Keeping Qualities.*—By actual test the following solutions have been found in excellent working order (but somewhat slower in action) after keeping for 17 years without any special precautions: (a) Pyro, 1 oz.; sulphurous acid, 1 oz.; water, 9 oz. 1 dr. (b) Pyro, 1 oz.; sodium sulphite, 4 oz.; water, 30 oz. Fresh accelerator was used in the test development.

*Pyro-Acetone Metol.*—(a) Pyro, 6 dr.; metol, 1 oz.; citric acid, 40 gr.; sodium sulphite, 4 oz.; hot water, 60 oz. (b) Acetone, 3 oz.; water, 60 oz. Take equal parts of (a) and (b), with 15 parts water.

*Bardwell's Acetone Developer.*—It is essential that a good stock sulphite of sodium solution be prepared. The sulphite of sodium used is a saturated solution. Take, for instance, 1 lb. bottle of sulphite and fill with water, and on shaking a few times it soon becomes saturated, then keep the bottle always at least half full of crystals and full of water. Four f.oz. of saturated solution is equal to 1 of

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crystals. Never use water hotter than 90° F. in dissolving the sulphite.

1.—Pyro.—Water, 2 f.oz.; saturated solution of sulphite, 2 f.oz.; acetone, 1 f.oz.; dry pyro, 5 gr.

2.—Metol-Hydroquinone.—(a) Water, 8 f.oz.; metol, 15 gr. Dissolve and add saturated solution sulphite, 4 f.oz.; hydroquinone, 60 gr.; 10% bromide potassium, 1 f.oz. (b) Take of (a) 2 f.oz.; acetone, 1 f.oz.

3.—Eiko-Hydro.—(a) Water, 8 f.oz.; saturated solution sulphite, 4 f.oz.; eikonogen, 50 gr.; hydroquinone, 25 gr. (b) Of above, 2 f.oz.; acetone, 1 f.oz. No. 1 is especially good for transparencies and stereoscopic work, No. 2 for velox or strong negatives, No. 3 for stereoscopic, landscape and portrait work. This developer does not frill or soften the film, does not stain or fog the film under any ordinary conditions.

*Pyro-Ammonia*.—(a) Soda sulphite (cryst.), 2 oz.; citric acid, 20 gr.; water, to 10 oz.; pyro, 1 oz. (b) Ammonia, 880, 1 oz.; water, to 10 oz. (c) Ammonium bromide, 1 oz.; water, to 10 oz. Take (a), 10 minims; (b), 10 minims; (c), 5 minims with water to 1 oz.

*Pyro-Caustic*.—(a) Pyro, 110 gr.; soda sulphite, 700 gr.; water, to 10 oz. (b) Caustic potash, 50 gr. (or caustic soda, 35 gr.); water, 10 oz. (a), 1 oz.; (b), 1 oz.; water, 1 oz. Develops quickly, similarly to metol. An excellent and cheap developer.

*Pyro-Metol (Imperial "Standard" Developer)*.—(a) Metol, 45 gr.; potassium metabisulphite, 120 gr.; pyro, 55 gr.; potassium bromide, 15 gr.; water, to 20 oz. (b) Caustic potash, 180 gr.; water, 20 oz. Dissolve the metol in 12 oz. water at 95° F. and the metabisulphite in 4 oz. at same temperature. When solution is complete, mix, add pyro, then bromide, and make up to 20 oz. with water. In making solution (a) begin with 14 oz. water at 105° F. Use equal parts of (a) and (b).

*Pyro-Metol Developer (Cramer's)*.—(a) Pure water, 30 oz. (720 c.c.); metol, 1 oz. (24 grams); citric acid, 40 gr. (2 grams); pyrogallie acid, ½ oz. (12 grams); bromide of potassium, 20 gr. (1 gram); dry sulphite of soda, ¼ oz. (6 grams). (b) Pure water, 30 oz. (720 c.c.); dry sulphite of soda, 4 oz. (96 grams). (Which will test 64° by hydrometer.) (c) Pure water, 30 oz. (720 c.c.); dry carbonate of soda, 4 oz. (96 grams). (Which will test 64° by hydrometer.) For use take: (a), ½ oz.;

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(b), ½ oz.; (c), ½ oz. Water at 65° to 70° F., 10 to 20 oz. (According to density desired.) (a), (b) and (c) may be mixed together and keep well in one solution which should be diluted for use with from 4 to 12 parts of water.

*Pyro-Potash*.—(a) Pyro, 440 gr.; soda sulphite, 1,110 gr.; sulphuric acid, 10 to 12 drops; water, 10 oz. (b) Potash carbonate, 2,000 gr.; soda sulphite, 550 gr.; water, 10 oz. (a), 45 minims; (b), 45 minims; water, 3½ oz.

*Pyro-Soda*.—Normal developer should contain in 1 oz.: Pyro, 2 to 4 gr.; soda sulphite (or equivalent), 20 to 30 gr.; potassium bromide, nil to 1 gr.; soda carbonate cryst., 20 gr. A typical formula: (a) Pyro, 1 oz.; sodium sulphite (cryst.), 2 oz.; citric acid, 40 gr.; water, to 10 oz. (b) Sodium carbonate (cryst.), 8 oz.; sodium-sulphite (cryst.), 8 oz.; water, to 80 oz. Take 1 oz. (b), 1 dr. (a) and 1 oz. water.

*Pyro-Soda*.—(a) Pyro, 90 gr.; potassium metabisulphite, 20 gr.; water, 20 oz. (b) Sodium carbonate, 3½ oz.; sodium sulphite, 1 oz.; water, 20 oz. Use equal parts. Specially recommended for extremely short exposures.

*Other Pyro Developers*.—1.—The following formula, given by Captain Abney in his splendid treatise on photography (of the greatest service to the expert) is an excellent one, giving the very highest results, and is deservedly popular. The solutions here given will have to be made up and kept in tight-fitting stoppered bottles: (a) Pyro Solution.—Pyrogallie acid, 50 gr.; sodium sulphite, 150 gr.; citric acid, 10 gr.; water, 1 oz. (b) Bromide Solution.—Potassium bromide, 50 gr.; water, 1 oz. (c) Ammonia Solution.—Ammonia (0.880), 2 dr.; water, 2¼ oz. These are not exactly 10% solutions, but for all practical purposes may be regarded as such. Ten drops of (a), pyro solution, will contain 1 gr. of pyrogallie acid; 10 drops of (b), bromide solution, 1 minim of potassium bromide; 10 drops of (c), ammonia solution, 1 minim of pure ammonia.

2.—Beach's Concentrated Potash Developer.—Pyro Solution.—Warm distilled water, 4 f.oz.; sulphite of soda (pure), 4 oz. When cooled to 70° F., add sulphurous acid (strong), 3½ f.oz.; pyrogallie acid, 1 oz.

3.—Potash Solution.—(a) Carbonate potash (chem. pure), 3 oz.; water, 4 oz. (b) Sulphite soda (chem. pure crystals), 2 oz.; water, 4 oz. Mix (a) and (b) separately and then combine in one solution.

## Photography

### (Developers)

To prepare developers add 1 dr. of each (pyro and potash solutions) to each ounce of water.

4.—Cramer's One Solution Developer.—Stock Solution.—Sulphite of soda, crystals, 3 troy oz.; bromide of ammonium,  $\frac{1}{2}$  troy oz.; bromide of potassium,  $\frac{1}{2}$  troy oz.; pyrogalllic acid, 2 troy oz. Dissolve thoroughly in distilled water, 32 fl.oz. Add sulphuric acid, c. p., 20 minims; finally strougest aqua ammonia, 3 fl.oz., and water to make up bulk to 40 fl.oz. Measure the sulphuric acid and the aqua ammonia very exactly and keep the latter in a cool place. For use dilute as follows: For normal exposures, 1 oz. to 11 oz. water. For instantaneous exposures, use 1 oz. with 3 or 6 oz. water. For over-exposed plates, 1 to 20 oz. Fix in alum and hypo. bath.

5.—The pyro and carbonate of soda developer will give softness. Dissolve in water, 6 oz.; sodium sulphite, 2 dr.; sodium carbonate, 2 dr., and just before using add dry pyrogalllic acid, 3 gr. Should the density be too weak, put in twice the quantity of pyro. The softness is regulated by the quantity of pyro. No bromide is necessary.

6.—Hoover's Potash Developer.—(a) Water, 24 fl.oz.; sulphite of soda crystals, 4 oz.; citric acid, 120 gr.; bromide ammonium, 40 gr.; pyrogalllic acid, 2 oz. (b) Water, 24 fl.oz.; sulphite of soda crystals, 4 oz.; carbonate of potash, 6 oz. To develop a 5 x 7 plate, take water 4 oz.; (a), 2 dr.; (b), 2 dr. If more intensity is required, use more of both (a) and (b). More of (a) will restrain, more of (b) accelerate.

8.—Cramer's Pyro Developer.—Prepare the following solutions:

(a) Alkaline Solution.—Water, 64 oz. (1,250 c.c.); carbonate of sodium crystals (sal soda), 2½ oz. (50 grams); sulphite of sodium crystals, 3 oz. (60 grams). This will produce negatives of a warm tone. If the sulphite is increased to 6 oz. the negatives will be of a gray or black tone. The alkaline solution must be kept in well stoppered bottles. If the negatives show yellow stain, make a fresh solution and try another lot of sulphite crystals.

(b) Pyro Solution.—Distilled or pure ice water, 6 oz. (300 c.c.); oxalic acid, 10 gr. (1 gram); sulphite of sodium crystals, 1 dr. (6 grams); pyrogalllic acid, 1 oz. (50 grams). All pyro solutions work best while fresh. 8 gr. dry pyro may be substituted for 1 dr. of this solution.

(c) Bromide Solution.—Water, 10 oz.

### (Tank Development)

(300 c.c.); bromide of potassium, 1 oz. (30 grams). For use—Alkaline solution, 8 oz. (250 c.c.); pyro solution, 2½ dr. (10 c.c.). When the developer is quite new the addition of bromide solution, 10 to 40 min. (1 to 3 c.c.) is necessary to make it work perfectly clear. Keep the developer moderately warm in winter, cool in summer. Bromide solution produces intensity, contrast and clearness.

Pyrocatechin.—(a) Pyrocatechin, 90 gr.; soda sulphite crystals, 1 oz.; water, 10 oz. (b) Caustic soda, 55 gr.; water, 10 oz. (a), 1 oz.; (b), 1 oz.; water, 2 to 6 oz.

Rodinal (liquid para-amido-phenole).—For average work, dilute 1 oz. with 25 oz. of water. For density in moderate time, 1 in 10. For over exposures, 1 in 10 to 15, and add potassium bromide. For under exposure, 1 in 30 to 40 or 50.

Rodinal Hydroquinone.—(a) Potassium carbonate, 2 oz.; rodinal, 1 oz.; water, 20 oz. (b) Sodium sulphite (crystals), 1 oz.; citric acid, 5 gr.; potassium bromide, 60 gr.; hydroquinone, 120 gr.; water, 20 oz. For normal work, equal quantities (a) and (b); for detail, more (a) than (b); for density, more than (b) and (a).

Rytol, 1 tabloid; accelerator, 1 tabloid; water, 4 oz.

Satropol.—Substitute for metol above.

Paper Negatives, Developers for.—The Rotary Co. recommends ferrous oxalate, ortol, metol, hydroquinone, or amidol; for all of which formulae will be found above. Fix in acid hypo.

Self-Developing Plates, To Make.—Hydroquinone, 45 gr.; acetone sulphite, 1 oz.; water, 10 oz. Soak the plates for 2 minutes and dry in the dark. Develop in water, 10 oz.; potassium carbonate,  $\frac{1}{4}$  oz. Ordinary plates lose about half their speed through this treatment.

### Stand or Tank Development.

Stand Developers may be made from almost any ordinary developer by diluting with water. Glycin is the most suitable.

Time and Dilution.—The time required for development is roughly proportionate to the dilution. Thus, if normal development requires 5 min., the addition of its own bulk of water will make it need 10 min., or 11 bulks of water will make it need 1 hour. Developers can be so far diluted that the plates may be left in them all night; but generally with bad effect upon the gelatine. 20 min. to an hour is most satisfactory.

## Photography

(Fixing, Clearing, Etc.)

### Combined Developing and Fixing.

*Kachine.*—(a) Kachine, 120 gr.; soda sulphite, 1,200 gr.; water to 16 oz. (b) Caustic soda, 80 gr.; water to 10 oz. (c) Hypo, 1 oz.; water to 2 oz. **Take:** (a), 160 minims; (b), 240 minims; (c), 20 minims; water to 1 oz.

### Development After Fixing.

Fix and wash the exposed plate; using the potassium permanganate solution to discharge the last of the hypo, and giving a wash after the permanganate. Place for 10 min. in potassium bromide, 10 grams; copper sulphate, 10 grams; water, 200 c.c.; wash. Place in silver nitrate, 2 grams; water, 1,000 c.c. The copper and silver baths may have to be repeated, washing well after each; and by such means any desired strength of image may be built up.

### FIXING, HARDENING AND CLEARING

*Stock Fixing Bath.*—Hypo (2 lb.) dissolved in nearly boiling water, and make up, when cool, to 6 oz. Each oz. =  $\frac{1}{2}$  oz. of hypo. For negative fixing bath, take stock, 8 oz.; water, 12 oz. (i.e., 4 oz. hypo per pint. For thickly coated plates, take: Stock, 12 oz.; water, 8 oz. (i.e., 6 oz. per pint). To dissolve hypo rapidly, wrap crystals in coarse muslin, and hang just inside the neck of a jug filled with nearly boiling water. Time of solution for 2 lb. less than 5 minutes.

*Acid Fixer.*—Stock, 8 oz.; potassium metabisulphite, 1 oz.; water, 12 oz. Or, Hypo, 4 oz.; acetone sulphite,  $\frac{1}{4}$  oz.; water, 20 oz. Or, With sodium bisulphite lye, add  $1\frac{1}{2}$  oz. of lye per lb. of hypo. This is probably the best and cheapest acid fixer obtainable.

*Fixing Hardening Bath.*—As the result of exact tests with 13 standard formulae, Professor Namias finds the following is the best bath: Chrome alum solution ( $1\frac{1}{2}\%$ ), 50 c.c.; hypo solution (50%), 50 c.c.; sodium acetate, 2.5 gram.

*Chrome-Alum-Acid-Hypo Fix-hardening Bath.* (a) Hypo, 16 oz.; water, 48 oz. (b) Sulphuric acid, 1 dr.; water, 2 oz. (c) Chrome alum, 1 oz.; water, 8 oz. Add (b) to (a), and (c) to the whole.

*Paper Negatives, Fixing Bath for.*—Always use acid hypo, e.g.: (a) Sodium sulphite, 2 oz.; citric acid,  $\frac{1}{2}$  oz.; water, 5 oz. (b) Hypo, 8 oz.; water, 35 oz. After complete solution, add (a) to (b).

*Hypo Eliminator.*—1.—The best is plain water. Fix for 5 minutes, after

(Fixing, Clearing, Etc.)

the last white silver bromide is gone, and wash for 1 hour in running water, or give 12 5-minute soaks in changes of water.

2.—Potassium percarbonate is a good chemical destroyer of hypo. Rinse the plate from the fixing bath, cover with clean water, and add 3 to 5 gr. of potassium percarbonate for every quarter plate. Rock, remove plate when liquid ceases to effervesce, and wash for 5 minutes.

3.—Potassium Permanganate.—Pass the fixed plate through several changes of water tinged a faint rose pink with a drop or two of permanganate solution, until the color ceases to be discharged, showing that no hypo remains.

4.—Ammonium chloride, 1 part; water, 10 parts. Rinse the plate after fixing; lay in ammonium chloride solution for a minute or so, then wash. This bath converts the hypo remaining in the film into ammonium thiosulphate, which diffuses through gelatine much more quickly than hypo; therefore, is more easily washed out.

*Hardening Baths.*—Formaline, 1 oz.; water, 10 to 25 oz. A 1 in 10 solution requires about 5 minutes for complete action; a 1 in 20, about 15 minutes. Best to use the former. Or, Alum, 1 oz.; water 30 oz.; for 10 to 20 minutes. Or, Chrome alum, 1 oz.; cold water, 30 oz.; for 10 to 20 minutes.

*Clearing Solution.*—1.—Alum, 1 oz.; citric acid, 1 oz.; sulphate of iron, 3 oz.; water, 20 oz. Soak for a minute or two, when clearing should be complete.

2.—(Clearing Solution for Pyro Negatives (J. Hay Taylor).—Alum, 2 oz.; hydrochloric acid, 2 fl.oz.; boric acid, 1 oz.; water, 32 fl.oz. The solution can be used over and over again. It will do its work in  $\frac{1}{2}$  minute. The negative should be well washed.

3.—Clearing Solution for Gelatine Bromide Plates.—Alum, 2 oz.; citric acid, 2 oz.; sulphate of iron, 6 oz.; water, 40 oz.

4.—Sometimes, by prolonged development, negatives become stained, and usually clearing solutions are employed after the negative is fixed.

5.—Saturated solution of alum, 10 fl.oz.; hydrochloric acid (commercial),  $\frac{1}{2}$  oz. After fixing and washing the negative, immerse in the above solution. Wash well.

6.—Negatives which, after development by ferrous oxalate, are opalescent from oxalate of lime, are immersed in the following solution: Water, 100 parts; oxalate of iron, 2 parts; alum, 8 parts. By which the opalescence will be completely

## Photography

### (Stain Removers)

cleared, and the whites of the negative will remain transparent.

7.—Alum, 2 oz.; citric acid, 1 oz.; water, 10 oz. Wash moderately after fixing, and immerse the negative in the above.

8.—Saturated solution of alum, 20 oz.; hydrochloric acid (commercial), 1 oz. Immerse the negative, after fixing, having previously washed it for 2 or 3 minutes under the tap; wash well after removal from the alum and acid.

9.—Chautauqua Clearing Solution.—Alum, 2 oz.; water, 30 fl.oz.; citric acid,  $\frac{1}{2}$  oz.

**Stain Removers.** (Arranged roughly in order of increasing action on obstinate stains.)

*Slightly Discolored Negatives.* Use acid-chrome alum. For appreciable yellow pyro stain, acid-iron-alum or potassium persulphate.

*Negatives to Be Intensified.*—Place for 15 minutes in acid-alum or acid-chrome-alum, which destroy the last traces of hypo.

*Acid Sulphite.*—Soda sulphite solution, 25%, 6 oz.; tartaric acid, 2 oz.

*Potassium Iodide and Hypo.*—Hypo bath (1 in 4), 10 oz.; potassium iodide (5 gr. per oz.) solution, 50 minims. Acts very slowly.

*Salt and Nitric Acid.*—Add 1 or 2 drops of nitric acid to salt, 10 gr.; water, 1 oz.

*Acid-Alum.*—Alum, 1 oz.; water, 20 oz.; to which add hydrochloric acid,  $\frac{1}{2}$  oz.; or citric acid,  $\frac{1}{2}$  to 1 oz.

*Acid-Chrome-Alum.*—Chrome alum, 45 gr.; water, 10 oz.; to which add citric or hydrochloric acid.

*Acid-Iron-Alum.*—Citric acid, 1 oz.; ferrous sulphate, 3 oz.; alum, 1 oz.; water, 20 oz. Or, Sulphuric acid, 30 to 60 minims; ferrous sulphate, 3 oz.; alum, 1 oz.; water, 20 oz.

*Potassium Persulphate.*—Use  $\frac{1}{2}\%$  solution for 5 minutes; rinse, and repeat.

*Thiocarbamide.* 10 gr.; citric acid, 5 gr.; water, 1 oz. Or, Thiocarbamide, 10 gr.; alum, 10 gr.; acetic acid, 5 gr.; water, 1 oz.

*Thiosinamin.* 8 gr.; citric acid, 4 gr.; water, 1 oz.

*Hypo-Glycerine.*—Hypo, 1 oz.; water, 1 oz. Dissolve, and add glycerine, 1 oz. Paint over dry negative and leave 12 hours.

*Gold Tonino, for Yellow Pyro-stained Negatives.*—Gold chloride,  $2\frac{1}{2}$  gr.; ammonium sulphocyanide, 35 gr.; water, 10 oz.

### (Stain Removers)

*By Redewlopment.*—Bleach in potassium bichromate, 15 gr.; hydrochloric acid, 5 minims; potassium bromide, 5 gr.; water, 1 oz. Wash, and redevelop in clean developer.

*Eau de Javelle, or Labarraque's solution (sodium hypochlorite).*—Shake up bleaching powder (1 oz.) with cryst. soda carbonate ( $1\frac{1}{2}$  oz.), previously dissolved in a little water. Filter. Shake up undissolved residue with plain water, and again filter. Use filtrate. Can be acidified with oxalic acid, when it removes stain even better, but attacks silver image. Safest when alkaline.

*Dyeing Method.*—Staining of yellow film in weak aniline blue solution produces a green which retards printing less.

*Hydroquinone Stains.*—Apply weak Farmer's reducer to dry negative with cotton wool. Rinse frequently. Or, Bleach in potassium bichromate, 15 gr.; hydrochloric acid, 5 minims; potassium bromide, 5 gr.; water, 1 oz. Wash, and redevelop in clean metal or other developer. *N. B.*—Plates developed with hydroquinone should be well washed before fixing.

*White Scum from Oxalate Developer.*—Rub negative with cotton wool wetted in hydrochloric acid, 4 drops; water, 1 oz. Or, Immerse plates in alum solution.

*Damp Stains.* From envelopes in which gum or paste has come in contact with film; or from storage in damp room; Potassium bichromate (saturated solution), 10 c.c.; water, 100 c.c.; pure hydrochloric acid, 3 c.c. Treat until whole surface, including stains, is bleached. Redevelop in any vigorous developer until blackened through to the glass.

*Iridescent Edges on Plate.*—Rub with alcohol, using chamois leather. The latter removes by friction, not chemically.

*Silver Stains.*—Place for 10 minutes in potassium iodide solution (20 gr. per oz.). Wash, and transfer to potassium cyanide solution (30 gr. per oz.), rubbing with cotton wool. Old stains require longer treatment and stronger solution than above. Iodine solution (in potassium iodide) of deep brown color can be used in place of potassium iodide, but is more risky. Or, (a) Ammonium sulphocyanide, 30 gr.; water, 1 oz. (b) Nitric acid, 30 minims; water, 1 oz. Mix (a) and (b), wash plate afterward, place in chrome alum, and wash again.

*Green Fog.*—Redevelop as above. Or, Intensify with Monckhoven solution. Or, Thiosinamin (above). Or, Thiocarbamide (above).

## Photography

### (Intensification)

#### Rapid Drying of Negatives.

1.—Rinse from the hypo bath, place in 1:50 formalin for 10 minutes, wash by pouring nearly boiling water 6 times over the negative, and dry by heat. To get rid of the relief which is produced by this process, the negative is rubbed with a piece of wash leather moistened with alcohol.

2.—After washing in the usual way, or using a hypo eliminator, lay a piece of old, fine cambric on the negative, and firmly pass a roller squeegee over it. The negative, with much of the water thus removed, will dry in a few minutes in a moderately warm place.

3.—Soak in 2 successive baths of methylated spirit, and place in a current of air. The present commercial spirit, owing to the mineral naphtha in it, causes a whitish scum on the surface of the film, and is not favorable to clean work.

### INTENSIFIERS AND REDUCERS

**Bleaching. Mercury Bichloride.**—Mercury bichloride, 120 gr.; ammonium chloride, 60 gr.; water, 10 oz. Or, Mercury bichloride, 120 gr.; potassium bromide, 60 gr.; water, 42 oz.

**Blackening Reagents, to follow Mercury Solution After Well Washing.**—(a) gives slight additional brilliance. (b) or (c) gives practically double. (b) or (c) twice over gives a second step, about equal to (d). (e) gives still more than (d). (a) Soda sulphite, 10% solution, made just acid with citric acid, intensifies only slightly. (b) Ferrous oxalate developer. (c) Alkaline developers: pyrosoda, pyroammonia (brown deposit), hydroquinone, black. (d) Ammonia (.880), 20 drops per oz. (e) Schlippe's salt (sodium sulphantimonate). Dissolve 10 to 20 gr. per ounce, as wanted. Great intensification. (f) Potassium gallate. Gallic acid, 1 gr.; caustic potassium, 16 gr.; water, 32 oz. Make fresh. (g) Mercuric chloride, 10 gr.; potassium iodide, 10 gr.; potassium cyanide, 20 gr.; water, 1 oz. Dissolve in this order. Iodide produces a red precipitate, which disappears in cyanide. Negative becomes yellowish, then dark brown, and much darker. From this point density becomes less, and in time image will entirely disappear. Usually best to arrest process during this last stage; too great contrast earlier.

**Monckhorst's Formula.**—Bleach as above, and blacken in: (a) Silver nitrate, 100 gr.; water, 10 oz. (b) Potassium cyanide, 10 gr.; water, 1 oz. Add (b)

### (Intensification)

to (a) slowly, until white precipitate is nearly all gone, but not quite. Gives great density, which decreases back to the original density on allowing the plate to remain. If negative is too dense when dry, reduce in hypo, 20 gr.; water, 1 oz.

**Mercuric Iodide (Lumière).**—Mercuric iodide, 45 gr.; soda sulphite (anhydrous), 440 gr. (or 880 gr. of crystallized salt); cold water, 10 oz. Keeps in the dark. For permanent results, wash when intensified enough, and treat with any non-staining developer; or, better, 5% sodium sulphite.

**Agfa Intensifier.**—1 part to 9 water. Too long action bleaches the plate, which must then be rinsed and a developer applied.

**Chromium (Great Intensification).**—Bleach in potassium bichromate, 100 gr.; hydrochloric acid, 50 minims; water, 10 oz. Wash thoroughly. Redevelop in amidol, rytol or metol-hydroquinone, not hydroquinone.

**Copper Bromide and Silver.**—(a) Copper sulphate, 200 gr.; hot water, 1 oz. (b) Potassium bromide, 200 gr.; hot water, 1 oz. Mix (a) and (b), cool, and apply to well washed plate until bleached to the back. Wash for five minutes only, and blacken in silver nitrate, 44 gr.; water, 1 oz. For extra density, rinse, and apply an ordinary developer. To reduce density after silver, rinse, and immerse in weak hypo, or potassium cyanide solution (2 gr. per oz.). If too dense after developer, use an ordinary reducer.

**Uranium.**—(a) Uranium nitrate, 8 gr.; water, 1 oz. (b) Potassium ferri-cyanide, 8 gr.; water, 1 oz. Mix (a) and (b), and add acetic acid (glacial), 2 dr. Wash plate free from hypo, and wash afterward in large dish of still water until yellow stain is gone. To remove intensification: Weak solution of ammonia or soda carbonate. If plate is to be reintensified, treat in weak acetic acid for 5 minutes after this bath, and rinse. Not very permanent.

**Lead, for Black-and-white Subjects Only.**—Lead nitrate, 20 gr.; potassium ferri-cyanide, 30 gr.; acetic acid, 10 minims; water, 1 oz. Keep in the dark. Bleach in this, wash in 10% nitric acid (film very tender at this stage), then in water, and blacken with ammonium sulphide (commercial yellow solution), mixed with 10 to 20 parts of water. Or, With old hydroquinone developer. Or, With potassium bichromate, 40 gr.; ammonia (.880), 30 minims; water, 1 oz. Or,

## Photography

### (Reducing)

With Schlippe's salt, 45 gr.; ammonia (.880), 3 dr.; water, 10 oz.

#### Reducers.

*General Rules.*—For overexposed and overdeveloped negatives (buried in fog), use Farmer's reducer on a piece of cotton wool. For underexposed, chalky negatives, use persulphate cautiously.

*Farmer's (Potassium Ferricyanide and Hypo).*—Add a few drops of 10% potassium ferricyanide solution to  $\frac{1}{2}$  oz. of hypo and 5 oz. of water. Judge strength by color; pale orange acts slowly, orange is too strong. Use always as weak as possible. Keeps only a few minutes after mixing. Increases pluck or contrast in negative by acting more strongly upon the shadows than upon the high lights. *Stains* with this reducer are due to (1) old fixing bath instead of clean hypo; (2) too strong reducer; (3) too long action; replace solution, after 5 minutes' use, by fresh; (4) acid reducer, as from acid fixing bath. To remove stains, try 5% soda sulphite solution or a saturated solution of alum plus 60 minims of hydrochloric acid per pt.; or, ammonium sulphocyanide, 5 gr.; water, 1 oz.

*Persulphate.*—Ammonium persulphate, 480 gr.; sodium sulphite, 96 gr.; sulphuric acid, 48 minims; water to 10 oz. Place negative in 5% soda sulphite solution to stop action. If much reduced, fix again. Reduces high lights first, thus lessening contrast.

*Ceric Sulphate (Lumière).*—Add strong sulphuric acid, 20 minims, to 2 oz. of water; dissolve ceric sulphate (440 gr.) in this, and add water to make 10 oz. Makes 10% solution. Dilute with 9 times its volume of water, or less for dense negatives. Stainless. Keeps well. Ceric sulphate is best bought in acid solution ready for use. Reduces proportionately throughout.

*Rehder's (Ferric Potassium Oxalate and Hypo).*—Acts in 1 solution. Keeps in the dark. Does not stain. Potassium ferric oxalate, 20 gr.; soda sulphite, 200 gr.; water, 5 oz. Powder, shake until dissolved, and add oxalic acid, 75 gr. Shake until solution turns green, pour into second bottle, leaving excess of oxalic acid in first, and add hypo,  $2\frac{1}{4}$  oz., and water to make 10 oz. Or, in place of ferric potassium oxalate use ferric chloride (cryst.), 125 gr.; potassium oxalate, 220 gr.

*General and Local Reducer.*—Eau de Javelle, or Labarraque's solution, or the commercial preparation known as Holmes' ozone bleach, 20 oz.; chrome alum, 1 oz.;

### (Stripping)

water, 20 oz. Dissolve the alum in the water, by the aid of heat, if necessary, and mix with the bleach. Allow it to stand 24 hours, and filter. Immerse the dried negative in this till the surface begins to feel slimy, then rub with a wet tuft of cotton wool. Friction applied specially to one part will reduce the negative locally.

*Mechanical Rubbing Down with Alcohol.*—Take methylated alcohol, as free from water as possible, on a piece of smooth, hard linen or chamois leather, over the tip of the finger, and with this rub vigorously the film side of the negative. There is no chemical action; the alcohol merely hardens the film so that it will not rub up with the friction. The negative should be placed on a sheet or two of blotting paper, laid upon a perfectly level, hard surface. It is not necessary to follow carefully the lines of the part that requires to be reduced, as that part of the film which is most dense is also thick, and can be rubbed away to a very large extent without rubbing out any silver from the clearer film around it.

### VARNISHING, STRIPPING, RETOUCHING AND SPOTTING NEGATIVES

#### Negative Varnishes (Applied with Heat).

Shellac,  $3\frac{1}{4}$  oz.; sandrac,  $\frac{3}{4}$  oz.; mastic, 40 gr.; castor oil, 1 dr.; rectified spirit (320 to 350), 30 fl.oz. Dissolve, and filter. Or, Sandrac,  $1\frac{1}{2}$  oz.; benzoin, 6 dr.; alcohol, 20 oz.; oil of lavender, 4 dr. Dissolve by shaking, and filter. Or, Orange shellac,  $1\frac{1}{2}$  oz.; methylated spirit, 20 oz.; castor oil, 20 drops. Or, Bleached lac,  $1\frac{1}{2}$  oz.; methylated spirit, 20 oz.

#### Unvarnishing Negatives.

Immerse in methylated spirit for 5 minutes, and rub with cotton wool. If any rosin remains, place in spirit, plus a little ammonia, and again rub with wool. Rinse twice with spirit, and flow water over; the latter should run off evenly. Or, Caustic potash, 1 oz.; methylated alcohol, 10 oz.; water, 10 oz. Put the negative in a dish, pour the solution on, and gently rock until the varnish is dissolved. Then wash well under the tap.

#### Stripping.

*Stripping Gelatine Negatives (Stock Solution).*—Methylated spirit, 25 oz.; water, 1 oz.; glycerine, 1 oz. Cut through film all around, about  $\frac{1}{4}$  in. from edges, and set plate level. Pour on stock solu-



## Photography

### (Retouching)

tion, with from 6 to 30 drops of commercial hydrofluoric acid per oz. Spread with bit of paper, and remove strips when loose; i.e., in 4 to 6 minutes. Coat glass plate with thin gum solution so as to get a film so thin as to show only on applying a moist finger to one corner. Apply a "paraffine sheet" to the negative, and squeegee lightly. Remove film and sheet together, by inserting a knife under the former, and apply to gummed plate after flowing with stock solution; lightly squeegee, and remove the sheet.

**Stripping Collodion Negatives.**—When thoroughly dry, coat with a 2% rubber solution in benzole, and, after this is dry, flow with alcohol, 5 oz.; ether, 5 oz.; pyroxyline, 50 gr.; castor oil, 30 minims; or, instead of pyroxyline, celluloid varnish may be used. Then cut around negative, and soak in acetic acid, 1 oz.; water, 10 oz.; until the film can be easily lifted. Or the negative may be stripped immediately after finishing, and before drying, if film is flowed with nitric acid, then rinsed, cut around, paper squeegeed on, then lifted, and, if reversing is required, transferred to another paper. While on this paper it may be trimmed with a pair of scissors to exact size, and transferred to glass previously flowed over with gum water or rubbed with smooth starch paste.

### Retouching and Spotting Negatives.

**Retouching Media.**—1.—Rosin, powdered, 60 gr.; turpentine, 2 oz.

2.—Gum dammar, 150 gr.; turpentine,  $2\frac{1}{2}$  oz.; benzine,  $2\frac{1}{2}$  oz.; oil of lavender, 50 drops.

3.—Sandarac, 1 oz.; alcohol, 6 oz.; castor oil, 10 oz.; Venice turpentine,  $\frac{1}{2}$  oz.

4.—Sandarac, 1 oz.; alcohol, 2 oz.; benzine, 4 oz.; acetone, 4 oz.

**Retouching Medium, To Remove.**—Rub with cotton wool and benzole, using fresh cotton wool until it comes away quite clean.

**Matt Varnish.**—Mastic, 20 gr.; sandarac, 30 gr.; ether, 2 oz.; benzole,  $\frac{1}{2}$  oz. For coarser matt, add more benzole, up to 1 oz.

**Spotting Media.**—1.—Grind Chinese ink and Payne's gray (each in cakes) with a little gum water.

2.—Thin down ordinary sepia (moist water-color) with black writing ink to the consistency of cream.

3.—Scrape off the films from old negatives, boil up with water, filter off the silver, etc., and mix it with gum water for use.

**Medium for Spotting and Blocking Out.**

### (Printing Papers)

—1.—Gamboge and vermilion red, ground together in water, in equal parts.

2.—Payne's gray and vermilion, ground together in water, in equal parts. Add a trace of gum water if a glossy surface is wanted.

**Blocking-out Mixture.**—Asphaltum, 1 oz.; beeswax, 170 gr.; carbon black, 80 gr.; turpentine, 10 oz. "Brunswick black" is well adapted for ordinary purposes, and is cheap.

**Titles on Negatives.**—Make an ink with the following: (a) Water, 4 oz.; sugar, 7 dr.; glycerine, 3 dr. (b) Alcohol, 5 oz.; nitrate of mercury, 5 dr.; perchloride of mercury,  $2\frac{1}{2}$  dr. Mix, and write title on a piece of paper; when dry, transfer to negative by rubbing back of paper with a paper knife. This bleaches the image.

## PRINTING PROCESSES

### Papers for Sensitizing.

**Papers for This Purpose.**—Whatman's, Rives', Saxe's, etc. The paper must be free from hypochlorite bleach and from metallic specks.

**Sizing.**—Bleached lac, 1 oz.; borax,  $\frac{1}{2}$  oz.; water, 10 fl.oz. Or, Bleached lac,  $\frac{1}{2}$  oz.; sodium phosphate,  $\frac{1}{2}$  oz.; water, 10 fl.oz. Break the lac small, and wash in several changes of water; then place in an enameled saucepan. The borax (or sodium phosphate), already dissolved in the water, is poured over, and the whole boiled gently for a couple of hours, adding water as it evaporates. Stand for 24 hours, pour off the clear liquid, and filter. Phosphate size makes a paper that gives a good tone on fixing only. The borax-sized paper needs toning.

**Sizing and Salting.**—Rub arrowroot, 180 gr., into a cream with water; bring 15 oz. of water to the boil, and add the cream slowly, with stirring. Dissolve ammonium chloride (120 gr.), soda carbonate crystals (200 gr.) and citric acid (60 gr.) in 5 oz. of water, contained in a 20-oz. vessel. Stir well, and filter through muslin while hot. Immerse paper for 2 minutes. It is well to dip twice, allowing paper to nearly dry in the interval, and hanging up to dry by opposite ends after the separate dippings. With 270 gr. of arrowroot more brilliant prints are given. Or, Gelatine, 20 gr.; ammonium chloride, 80 gr.; sodium citrate, dry, 100 gr.; common salt, 30 gr.; water, 10 oz. Swell the gelatine in part of the water, and dissolve by heat; add the salts, and filter. Or, ammonium chloride, 96 gr.; soda nitrate,

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### (Printing Papers)

96 gr.; gelatine, 10 gr.; water, 10 oz. Or, Gelatine, 30 gr.; ammonium chloride, 60 gr.; water, 10 oz. Float the paper for 5 minutes.

**Salting After Sizing.**—Chloride of ammonium, sodium, or strontium, 10 gr. to 1 oz. of water; or chloride of borium or mercury, 20 gr. to the ounce. Float 2 minutes.

**Sizing-Salting with Agar Agar.**—(Very fine matt prints).—Swell agar-agar, 45 gr., in cold water, 10 oz. for 1 hour; boil for 10 minutes, add sodium chloride, 50 gr., and keep warm for half an hour. Decant from sediment, and pour in clean, flat dish to set. Cut jelly up into small pieces, squeeze through damp nainsook muslin, and use about  $\frac{1}{2}$  oz. of this jelly per 22½ x 17 sheet, spreading with Blanchard brush, and evening with soft mop brush.

**Baryta Pacing.**—Used for most emulsion papers, as printing out paper, bromide, gaslight. (a) Gelatine, 180 gr.; barium chloride, 30 gr.; distilled water, 10 oz. (b) Ammonium sulphate, 30 gr.; distilled water, 5 oz. Swell the gelatine in cold water, add the chloride, and dissolve by gentle heat in a jacketed pan; add (b), a little at a time, stirring thoroughly. Allow the emulsion to set, squeeze through coarse muslin to break it into shreds, wash in several changes of water, press dry, then melt again, and add slowly, with stirring, chrome alum, 15 gr.; water, 1 oz.

**Albumenizing Paper.**—White of fresh eggs, 2 oz.; ammonium chloride, 160 gr., dissolved in 1 oz. of water. Place in vessel many times the size of the mixture, and beat into a froth. Stand 24 hours, filter through muslin, and float paper thereon 3 minutes.

**Double Albumenizing.**—After first coating, coagulate on methylated spirit, 4 parts; water, 1 part; then float as before.

**Monckhoren's Sensitizing Solution.**—Nitrate of silver, 6 parts; nitrate of magnesia, 6 parts; distilled water, 50 parts. Each time, after sensitizing a sheet in this solution, 1 dr. of a 1 to 8 solution of nitrate of silver should be added to the bath for every 100 sq. in. of paper sensitized.

**Sensitizing Solution for Paper.**—Nitrate of silver, 5 dr.; distilled water, 5 oz.; nitric acid, 2 drops; kaolin, 1 oz.

**Matt and Semi-Matt Lac Paper.**—(a) White lac, freshly bleached, 360 gr.; borax, 180 gr.; water, 10 oz.; gelatine, swollen in water, 100 gr. (b) Sodium phosphate, 180 gr.; white lac,

### (Printing Papers)

220 gr.; water, 10 oz.; gelatine, swollen in water, 100 gr. Boil (a) and (b) without the gelatine till the lac has dissolved, or for 2 hours; replace the water lost by evaporation, and add the gelatine; when dissolved, filter the solutions, and mix. Immerse paper for 20 seconds, and hang up to dry. Float for 2 minutes on ammonium chloride, 100 gr.; magnesium lactate, 100 gr.; water, 10 oz. Dry, and sensitize on 60-gr. silver bath.

**Plain Paper.**—(a) Gelatine, 100 gr.; ammonium chloride, 100 gr.; chrome alum, 5 gr.; water, 20 oz. (b) Gelatine, 100 gr.; salt, 100 gr.; sodium carbonate, 200 gr.; water, 20 oz. (c) Gelatine, 100 gr.; salt, 100 gr.; sodium carbonate, 100 gr.; sodium citrate, 50 gr.; water, 20 oz. (d) Barium chloride, 230 gr.; gelatine, 100 gr.; chrome alum, 5 gr.; water, 20 oz. Sensitize on silver nitrate, 800 gr.; distilled water, 20 oz. Divide this solution into 2 parts; to one add liq. ammonia to dissolve the precipitate first formed, then add the other portions, and then nitric acid, drop by drop, till any precipitate is nearly dissolved. The bath must be alkaline. (a) gives purple black tones, (b) sepia brown, (c) brownish black, (d) black-brown.

**Self-toning Paper.**—Chloride of gold, 60 gr.; ammonium chloride, 120 gr.; water, 30 oz. Float the paper for 2 minutes, and dry. Sensitize on silver nitrate, 3 oz.; distilled water, 16 oz. Add enough liq. ammonia (.880) to dissolve the precipitate first formed, and add enough water to make 20 oz. in all. Float for 3 minutes, and dry. Will keep about a week. Fix in hypo, 5 oz.; silver iodide, 14 gr.; water, 20 oz.

**Home-made Papers, Silver Papers, Plain Salted and Albumenized, Prints on Fabrics, Wood, Ivory, etc.**

**To Coat by Flooding.**—The following method is recommended to those who wish to coat paper evenly with any emulsion, and who have difficulty in floating. Prepare plates of glass, scrupulously clean, and rub well with talc, removing the talc with a brush. The pure paper to be coated should be thoroughly wet with distilled water and squeezed down to the talced surface. Stand to drain, then dry completely. For coating, warm the glass and its paper, level carefully, pour the warm emulsion on the dry paper, and drag it to the corners with a glass rod, bent into L-shape.

**Sensitizing Baths.**—Silver nitrate 140

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### (Printing Papers)

gr.; citric acid, 100 gr.; distilled water, 2 oz. Or, Silver nitrate, 50 gr.; ammonium nitrate, 50 gr.; water, 1 oz. Apply with a 2-in. camel's-hair brush, set in wood or rubber (not metal), or with a Blanchard brush of swansdown or fine flannel; or float. For rich tones, sensitize twice, drying between, and hanging by opposite ends for the two dryings.

**Preserving.**—The citric acid used in some formulæ is intended as a preservative. Alternately: float, back downward, for a couple of minutes on citric acid, 50 gr.; water, 1 oz.; after sensitizing and drying.

**Fuming.**—Immediately before printing. In the top of a closed box, with strong ammonia sprinkled at the bottom, or laid in a saucer.

**Gold Toning Baths.**—Any of those given for albumen paper, diluted with an equal volume of water.

**Platinum Toning bath.**—Potassium chloroplatinite, 1 gr.; salt, 10 gr.; citric acid, 30 gr.; water, 8 oz.

**Firing Bath.**—Hypo, 2 oz.; salt, 1 oz.; washing soda,  $\frac{1}{4}$  oz.; water, 20 oz.

**A Paper for Rich Effects, Especially in Large Sizes.**—Whatman's cold-pressed paper, without sizing, or with the following: Gelatine,  $2\frac{1}{2}$  dr.; common salt,  $2\frac{1}{4}$  dr.; water, 32 oz.; chrome alum solution, 10%, 1 oz. Sensitize on citric acid, 120 gr.; silver nitrate, 75 gr.; water, 1 oz. Tone with a weak gold bath.

**For Stronger Contrasts.**—Use an oxalate bath, after sensitizing and drying. Thus: Salt with common salt, 35 gr.; sodium citrate, 35 gr.; water, 4 oz. Sensitize on silver nitrate, 100 gr.; citric acid, 50 gr.; water, 4 oz.; for 5 minutes. When dry, float again on oxalic acid, 10 gr.; citric acid, 20 gr.; water, 1 oz. Keeps in good condition for 12 months.

**Ammonio-Nitrate Method.**—Arrowroot sized paper, as above. Sensitizer: Silver nitrate, 250 gr.; distilled water, 4 oz.; add strong ammonia, drop by drop, until the precipitate first formed redissolves; then add silver nitrate, 50 gr., in distilled water, 1 oz., and filter. Apply with a brush, not by floating. Sensitive paper keeps a few hours only.

**Iron-Silver Method.**—Salt with green ammonio citrate of iron, 32 gr.; ferric oxalate, 40 gr.; oxalic acid, 8 gr.; mercury bichloride, 8 gr.; gum arabic, 20 gr.; water, 2 oz. Mix 12 hours before use, and keep in a dark place. Float the paper, dry, and sensitize with silver nitrate, 100 gr.; citric acid, 70 gr.; tartaric acid, 20 gr.; water, 2 oz. Print until the halftones are fairly visible; de-

### (Printing Papers)

velop in water only; fix in hypo, 12 gr.; common salt, 36 gr.; water, 6 oz.

**Silver Sensitizing Bath for Albumenized Paper.**—Silver nitrate, 40 to 30 gr.; distilled water, 1 oz. Keep up to strength by adding double strength bath at the rate of  $\frac{1}{4}$  oz. for every sheet sensitized. For small baths, 20 oz. and less, add the  $\frac{1}{4}$  oz. after floating each sheet. For large baths, after the floating of each eight sheets.

**To Find Time of Floating.**—Brush a little weak potassium chromate solution on back of first sheet to be sensitized, just before floating, and note time required for yellow stain to become orange. This is correct floating period, and will be 3 to 5 minutes, usually. Paper does not keep; must be printed within a day or so of floating.

**Adjusting the Bath.**—For weak negatives, 80 gr. of silver nitrate per oz.; for hard negatives, 35 gr. per oz.

**Paper, To Keep.**—1.—Add 20 to 40 gr. of citric acid to each oz. of silver bath.

2.—Float paper, back downward, on citric-acid solution (1 oz. in 30 oz. of water) for 3 minutes, directly after sensitizing and blotting.

3.—Store between blotters soaked in soda bicarbonate solution (1 oz. in 10 oz. of water), and dried.

**Borax Toning Bath.**—Borax, 60 gr.; gold chloride, 1 gr.; water, 10 oz. Ready as soon as mixed. Keeps well. Can be used over again, by adding more gold solution. The borax gold toning bath is, without doubt, the best of all the formulæ. The discoloring to violet is of no consequence. Out of a 4-pt. bath pour into the waste crock 1 pt. each time toning takes place; add borax and chloride of gold solution to that quantity, when the rich color of the toned prints will be far superior to those toned in a silver bath.

**Sodium Acetate Toning.**—Stock solution: Gold chloride, 15 gr.; sodium acetate, 1 oz.; distilled water, 4 f.oz.; add a little chalk, shake up, allow to stand 24 hours. Take stock solution,  $\frac{1}{2}$  f.oz. to 20 f.oz. of water.

**Sodium Phosphate Toning.**—Sodium phosphate, 20 gr.; gold chloride, 1 gr.; water, 10 oz. Ready at once. Does not keep.

**Soda Bicarbonate Toning.**—Soda bicarbonate, 5 gr.; gold chloride, 1 gr.; water, 12 oz. Does not keep.

**Strontium Chloride Toning.**—(a) Gold chloride, 15 gr.; distilled water,  $1\frac{1}{2}$  oz. Heat nearly to boiling, and add strontium chloride, 150 gr. (b) Potassium

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### (Printing Papers)

sulphocyanide, 40 gr.; water, 1½ oz. Heat nearly to boiling, then add (a), in small quantities, with stirring. When cold, make up with water to 4 oz. Take 15 minims to 1 oz. of water.

**Line Toning.**—Chloride of lime, 2 gr.; gold chloride, 2 gr.; chalk, 1 teaspoonful; hot water, 16 oz. Use when cold. Keeps.

**Washing Paper.**—1.—For borax, acetate and "sel d'or" toning, the free silver is all washed out of the paper.

2.—For phosphate, bicarbonate and lime, slight milkiness of the last wash water is desirable.

**"Sel d'Or" Toning.**—Gold chloride, 1 gr.; pure hypo, 4 gr.; hydrochloric acid, 4 minims; water, 4 oz. Dissolve gold and hypo, each in 2 oz. of water; add gold to hypo slowly; add the acid.

**Fixing Bath.**—Hypo, 2 oz.; hot water, 20 oz. Use when cold. Do not guess the quantity of hypo. The temperature of this bath should be the same as that for toning and washing.

**Washing.**—Do not transfer prints immediately from the fixing bath to cold water. Pour off the hypo without draining the dish, and then place the prints, one by one, in salt, 8 oz.; water, 160 oz. Time of immersion, 6 to 8 minutes. Finally, wash in clear water.

**Solar Enlargement Paper.**—Float well sized paper for 3 minutes on ammonium bromide, 192 gr.; magnesium iodide, 460 gr.; magnesium chloride, 77 gr.; water to 20 oz. Will keep for some time in this state. Sensitize on silver nitrate, 960 gr.; glacial acetic acid, 384 minims; distilled water to 20 oz. As soon as surface dry, expose until shadow details are visible, then develop with gallic acid, 192 gr.; lead acetate, 96 gr.; glacial acetic acid, 1½ oz.; water to 20 oz. When development is complete, immerse in a very weak solution of carbonate of soda. Fix and wash.

**Gum-Silver Process.**—(a) Gum arabic, powdered, 50 grams; water, 100 c.c. (b) Solution (a), 5 c.c.; glacial acetic acid, 3 c.c. Stir (b) well into (a). Add (c): Nitrate of silver, 1 gram; distilled water, 3 c.c. Spread on to any pure paper with a stiff paint brush, not mounted in metal, and dry quickly in the dark. Print as for printing out paper, in direct sunlight. The print does not lose much in toning and fixing. Tone in gold or platinum, or both, and fix in 2% solution of hypo. Good red tones by fixing only. The tones vary according to the paper used. Very good results have been obtained on ordinary writing paper. The paper should

### (Printing Papers)

be used freshly sensitized, and is best at about 24 hours old.

**Prints on Parchmentized Paper.**—Immerse any good, non-loaded pure paper in 1 part of sulphuric acid and 1 part of water for a very brief time, taking out and returning, to see that no air bells remain. Wash briefly in 2 or 3 changes of water, then in water slightly alkalinized with ammonia. Salt with potassium iodide, 2 gr.; cadmium bromide, 1 gr.; barium chloride, 20 gr.; sugar, 20 gr.; water, impregnated with camphor, 2 oz. The last named ingredient can be obtained from the druggist. Sensitize (by brushing or floating) with nitrate of silver, 200 gr.; citric acid, 8 gr.; nitrate of uranium, 120 gr.; distilled water, 4 oz.; alcohol, 1 oz. Dry quickly, but not too near the heat. Expose until the image is faintly visible, about as in platinum prints. Develop with pyro, 4 gr.; citric acid, 8 gr.; acetic acid (glacial), 1 dr.; water, 8 oz. The development is rather slow, being retarded by the quantity of the acid, but this is advantageous. Rock constantly during the development. Develop until the image shows considerable intensity, as it weakens some in the fixing bath. Fix in hypo, 1 oz.; water, 16 oz.; alum, 4 dr.; for 15 or 20 minutes. Place in alum, 50 gr.; water, 8 oz.; for half an hour or more, until it assumes a rich brown color. Wash as usual with other prints.

**Copper Chromate Process.** In artificial light, sensitize well sized paper with copper sulphate, 125 gr.; potassium bichromate, 230 gr.; distilled water, 6 oz. [M. Dillaye recommends as more rapid, and giving better detail: Copper sulphate, 125 gr.; ammonium bichromate, 130 gr.; potassium bichromate, 110 gr.; water, 6 oz.] Dry in the dark. Print until a brown image shows on the yellow paper, with the finer details just visible, as in platinotype. Wash to remove the bichromate, until the unexposed parts are quite white on looking through the print. Develop in pyro, 15 gr.; acetic acid (glacial), 170 minims; water, 3¼ oz. The paper should be sized with gelatine (not rosin or arrowroot). Forge prints, clear with 1% solution of oxalic acid.

**Bichromate-Silver Process.**—Mix 10 gr. of bichromate of potash and 20 gr. of sulphate of copper in 1 oz. of distilled water. Paint this mixture over common writing paper, and let it dry. Then place the engraving, face downward, on the prepared side of the paper. Print as usual in sunshine. In about half an hour a faint copy is produced in yellow. This

## Photography

### (Printing on Fabrics, Etc.)

must be washed over with a solution of nitrate of silver, 20 gr. to 1 oz. of distilled water. When this is done a beautiful red picture makes its appearance. Fix by washing in pure water. If it be desired to change the color of the picture, soak it in salt and water until it disappears, then hold it to the sun for 5 minutes, and the same picture appears in a fine lilac color.

**Sensitizing Fabrics.** Soak for 2 or 3 minutes in gelatine, 50 gr.; common salt, 50 gr.; magnesium lactate, 50 gr.; water, 10 oz. Dry thoroughly. Sensitize for 3 minutes in silver nitrate, 25 gr.; water, 1 oz. Immerse for a minute in citric acid, 50 gr.; sugar, 50 gr.; water, 20 oz. Dry in the dark. Tone, fix, and wash as for printing out paper.

**Sensitized Fabrics, Size.**—Arrowroot, made into a paste with cold water and diluted with boiling water (containing 4 gr. of salt per oz.) until thin. Strain, and let cool. Wet the fabric in cold water, immerse in size solution, wring out, again immerse for 30 seconds, and dry before the fire. Sensitize for a few seconds in silver nitrate, 150 gr.; water, 3 oz.; and a trace of nitric acid, from a glass rod dipped in the acid and then in solution. Again dry before the fire. Print out, tone in gold acetate, and fix.

**Sensitized Fabrics, A Development Process.**—Rub the fabric with ammonia, 4 oz.; alcohol, 1 oz.; rinse till the water runs off freely, and dry. Dissolve gelatine, 20 gr.; water, 1 oz., by heat, and add potassium iodide, 26 gr.; ammonium bromide, 11½ gr.; ammonium chloride, 3¼ gr.; albumen, 20 minims; water, 1 oz. When thoroughly dissolved, and the solution not hotter than 90° F., add distilled water to 3 oz. Paint evenly over the canvas, fairly freely, and allow to dry. Then paint in the dark room with silver nitrate, 37 gr.; glacial acetic acid, 18 minims; distilled water, 1 oz. Expose while wet. To develop, paint or swab over with gallic acid, 20 gr.; lead acetate, 10 gr.; glacial acetic acid, 75 minims; distilled water to 2 oz. Fix in a 1 in 5 hypo solution.

**Glass Positives (Eburneum Process, Modified).**—Make a thin, clear, vigorous transparency on a dry plate (lantern plate preferred), taking care that the image is right-handed when seen through the glass. When dry, any coloring that is desired can be done on the film size; then the whole of the film is painted with flake-white paint. The picture can be backed with card and bound like a lan-

### (Printing on Ivory)

tern slide; mounted on a paperweight, or otherwise finished.

**Ivory, Wood, Metal, etc., A Transfer Process.**—Collodion Emulsion.—(a) Pyroxyline (gun cotton), 50 gr.; alcohol, 4 oz.; ether, 4 oz.; shake until pyroxyline is completely dissolved. (b) Silver nitrate, 240 gr.; distilled water, 4 dr. (c) Strontium chloride, 64 gr.; alcohol, 2 oz. (d) Citric acid, 64 gr.; alcohol, 2 oz. Now take (a), 2 oz.; add 30 drops of (b) in 1 dr. of alcohol, and shake well; add 1 dr. of (c), a few drops at a time, with shaking; then 30 drops of (d); shake well, stand for half an hour, and filter through a tuft of cotton wool. After making the stock solutions, all should be done in dark room or in amber light. The mixing may be done in daylight if an opaque or amber-colored bottle is used.

**The Stripping Paper.**—Float baryta-faced paper on gelatine, 90 gr.; white granulated sugar, 30 gr.; water, 6 oz. (filtered after solution, through muslin). Float for a few seconds after the paper flattens on the solution. Dry; coat with the emulsion in safe light. Print rather darker than is required for the finished print. Wash. Tone in gold chloride, 1 gr.; sodium acetate, 30 gr.; sodium bicarbonate, 10 gr.; water, 10 oz., which should be made some hours before use. Fix in plain hypo. Wash. To transfer, place the finished print in water at 150° F., when it will float off the paper in about 1 minute. Slip the perfectly cleaned ivory, etc., into the water, under the print; arrange it on the surface with a soft sable or camel's-hair brush; lift carefully from the water; place between 2 pieces of clean blotting paper and keep under light pressure, as in a printing frame, for a day.

**Transferring Silver (etc.) Prints to Wood.**—To decorate wooden trinket boxes, etc., remove the varnish with methylated alcohol, and rag and smooth the surface with the finest glasspaper, and polish with French polish, made with bleached lac. Soak the print in alcohol until quite pliable, lay it, face down, on the polished wood, and rub it into complete contact with a pad of cotton dipped in alcohol. When the spirit has evaporated the paper may be rubbed away with soft india-rubber dipped in lukewarm water, and with moistened finger tips. Care is needed, as the paper gets thin; but there should be no real difficulty. When all the paper is gone, dry, and apply white French polish.

**Ivory, Prints on.**—Gelatin-bromide emulsion process: Size with albumen,

## Photography

### (Gelatine Printing Out Paper)

made by whipping the white of 1 egg very thoroughly with 2 oz. of water, allowing it to stand for a day, then filtering. Coat with an emulsion made as follows: Nelson's No. 1 gelatine, 20 gr.; swell in water for half an hour, changing the water 3 times; place in a jacketed pan, and add distilled water, 2 oz.; ammonium bromide, 55 gr.; sodium chloride, 15 gr.; hydrochloric acid, 10% solution, 5 minims. Heat to 125° F., and stir until dissolved; then add silver nitrate, 100 gr.; distilled water, ½ oz.; add very slowly, with continuous stirring, and heat for 10 minutes at 150° F., then add hard gelatine, 88 gr., which has previously been swelled in water for half an hour, changing the water every 10 minutes. Stir until dissolved, and make up to 4 fl.oz. with distilled water. Allow to set in a cold place for 8 or 10 hours. Break up, by squeezing through coarse-meshed canvas, place in a clean linen bag, suspend in water, and change the water every 10 minutes for 3 hours. Drain well, remelt at 100° F., and add tannin, 1 gr.; and coat the ivory with this.

**Photographing Upon Marble.**—The following process for making photographic impressions upon marble has recently appeared in a technical magazine, and is said to give very fine results. The surface of the marble is well smoothed, but not polished. Upon this is spread a layer of the following mixture: Benzine, 500 grams; turpentine, 500 grams; bitumen, 50 grams; beeswax, 5 grams. This layer is allowed to dry, and the gelatine surface of the photographic plate is then applied, and an exposure of 20 minutes made by sunlight. After removing the plate, wash with gasoline, which takes off that part of the varnish which has not been acted upon by the light, and the image gradually appears. The action of the gasoline is stopped at the desired point by washing in a stream of water. The surface thus prepared is plunged into an alcoholic solution of Prussian blue, easine-red, etc. When the color has penetrated by capillary action, the layer of varnish is taken off and the surface of the marble finely polished. In this way a permanent image, of a fine color, and great depth, is obtained.

### Gelatine Printing Out Paper.

**For Matt and Semi-Matt Papers.**—Add starch (preferably fine potato starch) to the emulsion. Proportion according to texture desired.

**Printing Out Paper Emulsion.**—(a) Silver nitrate, 32 grams; citric acid, 8

### (Gelatine Printing Out Paper)

grams; hot water, 160 c.c. (b) Swell gelatine, 96 grams, in water, 700 c.c.; melt on the water bath, and add ammonium chloride, 2.8 grams. (c) Tartaric acid, 2.8 grams; sodium bicarbonate, 1.4 grams; alum, 1.8 grams; water, 140 c.c. Dissolve in this order. Mix (b) and (c) at 120° F., warm (a) at 120° F., and add, in small doses, with shaking. Ripen at 100 to 120° F. for several hours, filter through glass wool, in a hot-water funnel, and coat. For matt paper use 80 to 90 grams only of gelatine. Or, Gelatine (Nelson's No. 1 and Coignet's, equal parts), 350 gr.; ammonium chloride, 35 gr.; Rochelle salts, 100 gr.; silver nitrate, 150 gr.; alcohol, 8 dr.; water, 10 oz. Heat to 110° F., and allow to remain at this temperature for 10 min. after all is dissolved. Filter through chamois leather, and use while warm.

**Hardening Bath.**—Alum, 1 oz.; water, 10 oz.; use for 10 minutes. Or, Formalin, 1 oz.; water, 15 to 20 oz.

**Salt Bath (for Preventing Spots from Rusty Tap Water).**—Salt, 2 oz.; soda carbonate, 1 oz.; water, 20 oz. Place prints direct in this and then wash. Omit carbonate when intending to tone with platinum.

**Sulphocyanide Toning.**—Ammonium sulphocyanide, 20 gr.; gold chloride, 2 gr.; water (hot), 20 oz. Dissolve sulphocyanide in half the water, and gold in remainder. Add gold to sulphocyanide in oz. lots. Use when cold.

**Sulphocyanide Sulphite.**—Ammonium sulphocyanide, 20 gr.; soda sulphite, 2 gr.; gold chloride, 2 gr.; water, 20 oz. Slower than plain sulphocyanide, but less liable to double tones.

**Sulphocyanide Iodide (for Carmine Tones).**—Ammonium sulphocyanide, 75 gr.; potassium iodide, 8 to 20 gr.; gold chloride, 4 gr.; water, 35 oz. Overprint slightly. Use fresh.

**Gold Formate Toning.**—Sodium formate, 15 gr.; sodium bicarbonate, 2 gr.; gold chloride, 1 gr.; water, 10 to 20 oz. Does not keep.

**Gold Tungstate.**—Sodium tungstate, 30 gr.; sodium carbonate, 1 gr.; gold chloride, 1 gr.; water, 10 to 20 oz. Tones rapidly and evenly. Free from double tones.

**Gold Aluminum (for Brown-red Tones).**—Aluminum chloride, 20 gr.; sodium bicarbonate, 80 gr.; water, 10 oz. Dissolve; stand for half an hour; filter. Add 1 gr. of gold chloride per doz. half-plate prints. Can be used again and again, adding fresh gold.

**Gold Lime.**—Gold chloride, 2 gr.; pow-

## Photography

### (Gelatine Printing Out Paper)

dered chalk, 100 gr.; chloride of lime, 2 gr.; water, 16 oz. Keeps some hours. For black tones.

**Gold Uranium.**—Sodium acetate, 60 gr.; sodium bicarbonate, 10 gr.; sodium chloride, 30 gr.; water, 15 oz. Add uranium nitrate, 5 gr.; gold chloride, 4 gr.; water, 20 oz. For black tones. Must not be acid.

**Thiocarbamide Bath (Black and Blue-black Tones).**—Chloride of gold (1% solution), 1 oz. Add thiocarbamide (2% solution), till the precipitate first formed is redissolved. This will require from 260 to 285 minims; then add: Citric acid, 96 gr.; distilled water to 40 oz.; common salt, 192 gr. Slightly overprint and immerse 5 min. in salt, 2 oz.; water, 20 oz., then in the toning bath. Temperature, 65° F. For blue violet, tone 10 to 15 min., wash, and fix in 10% hypo. For blue-black tone 3 min., rinse, and immerse in: Hypo, 4 oz.; lead nitrate, 96 gr.; chloride of gold (1% solution), 1 oz.; water to 20 oz. Black tones: tone 4 min., rinse well, and tone 10 min. in any platinum bath.

**Stock Toning Bath Which Keeps.**—Heat 1½ oz. of distilled water to 100° F. in clean beaker, add 15 gr. of gold chloride and 150 gr. of strontium chloride, and heat to nearly boiling. Heat also 1½ oz. of distilled water and 40 gr. of potassium sulphocyanide to nearly boiling, and add gold solution (above) in 2-dr. lots, stirring continuously. Cool, and make up to 30 dr. To make bath, add from 4 to 8 oz. of water to 1 dr. of this stock solution.

**To Stop Gold Toning.**—Sodium sulphite, 50 gr.; water, 10 oz.

**Acid Toning.**—Gold chloride, 2 gr.; sodium hyposulphite, 10 gr.; hydrochloric acid, 10 minims; water, 10 oz. Dissolve the gold and the hypo each in 5 oz. of water. Pour the gold solution slowly, with stirring, into the hypo (*not vice versa*), then add the acid. Wash prints from free silver before toning or the solution will be spoilt.

**Brush Toning.**—(a) 10% solution ammonium sulphocyanide. (b) 10% solution phosphate of soda. (c) Borax, saturated solution. (d) Gold chloride, 1 gr. per dr. Take (a), 70 minims, add water to make 5 dr.; then add, little by little, (d), 1 dr.; and next, (b), 30 minims; (c), 80 minims. Apply with soft camel's-hair mop to dry print, using 35 to 40 minims per quarter plate. Tones in 2 minutes.

**Combined Bath (Without Lead).**—Ammonium sulphocyanide, 15 gr.; so-

### (Gelatine Printing Out Paper)

dium chloride, 30 gr.; hypo, 2 oz.; water, 10 oz. Add little by little: Gold chloride, 1 gr.; water, ½ oz. *Another—for red tones:* Sodium acetate, 120 gr.; ammonium sulphocyanide, 120 gr.; sodium hyposulphite, 2½ oz.; warm water, 10 oz. When cool, add 5 gr. of gold chloride in 1 dr. of water. Gives tones from terra cotta to purple brown. *Another—for black tones:* Hypo, 6 oz.; potass. sulphocyanide, 1 oz.; sodium acetate, 1½ oz.; alum, 100 gr.; water, 20 oz. When dissolved, add silver chloride, 100 gr. Leave for 24 hours, filter, and add: Gold chloride, 15 gr.; ammonium chloride, 30 gr.; water, 8 oz. Print deeply, and before placing in both immerse prints in: Soda carbonate, 1 oz.; water, 20 oz.

**Combined Bath With Lead.**—Hypo, 5 oz.; citric acid, 60 gr.; lead acetate, 60 gr.; ammonium sulphocyanide, 240 gr.; water, 20 oz. Dissolve in this order in hot water, boil, cool, filter, and add gold chloride, 3 gr. *Another—for black tones:* (a) Hypo, 4 oz.; water, 10 oz. (b) Lead nitrate, 1 oz.; distilled water, 10 oz.; acetic acid (glacial), 48 minims. Add (b) to (a) gradually, and with shaking, until a distinct cloudiness remains after well shaking. Filter. To use, take gold chloride, 1 gr.; mixture as above, 10 oz.

**Fixing Bath.**—Hypo, 3 oz.; water, 20 oz. Fix for 10 min., moving prints constantly.

The hyposulphite of soda fixing bath is best made to test with an argometer, because this instrument indicates grains to the ounce of water. Thus, mix a quantity of hyposulphite of soda in a quart of water, pour some of this into the test glass, place in the argometer. If it floats at 20 on the line of the liquid, this means 20 grains to the ounce, which is the right strength for all gelatine or albumin printing out papers; 18 is the strength for collodion paper, while for the fixing bath for negatives the strength may be anything from 80 to 100.

**Sulphide Toning (considered more permanent than gold-toned prints when properly done).**—Slightly overprint; lay for 10 min. in sodium carbonate, 1 oz.; common salt, 1 oz.; water to make 20 oz. Then fix, and wash thoroughly. Tone in sodium sulphide (*not sulphite*), 5 gr.; water, 20 oz., for about 15 min. If the paper in use tones quicker than this, reduce the strength of the bath, as slow toning insures permanency. Should not be conducted in any room where plates and sensitive papers are stored; the fumes will affect them.

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### (Gelatine Printing Out Paper)

**Platinum Toning.**—Potass. chloroplatinite, 3 gr.; sodium chloride, 50 gr.; citric acid, 50 gr.; water, 20 oz. No more salt than that given. Or, Potass. chloroplatinite, 2 gr.; phosphoric acid (sp. gr. 1.12), 3 dr. (fluid); water, 10 oz. Immerse dry prints in 10% salt bath for 5 min., wash, and tone in above.

**To Arrest Platinum Toning.**—Soda carbonate crystals, 10 gr.; water, 1 oz.

**Gold Platinum Toning.**—Sodium sulphite, 45 gr.; gold chloride, 1 gr.; potassium chloroplatinite, 1 gr.; water, 10 oz. Immerse prints in a 10% solution of common salt before toning.

**Developing Printing Out Paper (direct process).**—Print until all detail is just faintly visible. Develop, wash and tone.

**Hydroquinone.** 8 gr.; citric acid, 20 gr.; sodium acetate,  $\frac{1}{2}$  oz.; water, 10 oz.

**Pyro.** 3 gr.; water, 3 oz.; potass. bichromate solution ( $\frac{1}{2}$  gr. per oz.), 5 minims. Gives reddish sepia; or with 10 minims bichromate, brown color, needing no toning. For matt prints. Distilled water should be used throughout.

**Pyro Metol.**—Pyro, 10 gr.; metol, 10 gr.; citric acid, 20 gr.; potassium bichromate (1% solution), 2 to 5 minims; water, 10 oz. Gives sepia tones. For purple tones use 20 gr. of potass. metabisulphite in place of the citric acid.

**To Arrest Development** sharply, transfer to: Acetic acid, 10 minims; water, 10 oz.

**Developing Bromide Paper.**—Place print in 10% potass. bromide solution for 5 to 10 min. (1 or 2 min. for fresh paper); wash and develop in: (a) Hydroquinone,  $\frac{1}{2}$  oz.; soda sulphite, 2 oz.; water, 110 oz. (b) Potass. bromide, 15 oz.; soda carbonate (recrystallized), 12 oz.; water, 112 oz. For normal results: (a),  $\frac{1}{2}$  oz.; (b), 1 oz.; water,  $\frac{1}{2}$  oz. For greater contrast: (a), 3 dr.; (b), 1 oz.; water, 5 dr. For less contrast: (a), 7 dr.; (b), 1 oz.; water, 1 dr.

**Reducing Dark Prints.**—Make 10% solutions of (a), ammonium sulphocyanide, and (b), potass. ferricyanide. Take (a), 100 minims; (b), 10 minims; water, 1 oz. Use after toning and fixing. Or, Ammonium persulphate, 5 gr.; water, 1 oz. Best used before toning and fixing. If used afterwards, prints should be well washed before and after persulphate, re-fixed for a moment and again washed.

**Intensifying Weak Spots.**—Bleach in mercuric chloride, saturated solution, wash well and darken in: Ammonia, 1 dr.; water, 10 oz.

**Medium for Hot Burnishing.**—Castile soap (1 oz.), warmed with water ( $2\frac{1}{2}$

### (Collodion Printing Out Paper)

oz.), and added to methylated spirit (17 $\frac{1}{2}$  oz.). Allow to stand 3 or 4 days, with occasional shaking, and filter. Rub over prints with flannel.

**Opalines, Mounting Solution for Prints.**—Soak good soft gelatine (2 oz.) in water (20 oz.), and liquefy with gentle heat, standing the vessel in hot water. Thin down with warm water until scarcely thicker than water. Both print and glass must be immersed until quite warm, taken from solution with face of print in contact with glass, and at once squeezed with firm use of flat rubber squeegee.

**Self-Toning Paper.**—Papers of the "print out" silver type, which require fixing only to give toned print effects. Instructions vary a little; except where otherwise stated, place prints in fixing bath without preliminary wash. In all cases wash very well at close of the fixing.

**Aristo Collodion.**—Warm tones, 2 changes of water. 15 min. in: Hypo, 1 oz.; water, 8 oz.; ammonia, a few drops; then 10 min. 5% solution common salt. Cold tones: 5 min. in 2% solution common salt; wash slightly. 15 min. in: Hypo, 1 oz.; water, 8 oz. Kodak (self-toning) Solio: 3 to 5 min. in ammonium sulphocyanide, 20 gr.; water, 20 oz.; 5 min. in running water; then 10 min. in 15% hypo. Or, 5 min. in common salt 5% solution, then 15% hypo. Kodak Collodion: Cold tones, 10 min. in 12 $\frac{1}{2}$ % hypo. Warm Brown: Wash in 3 changes of water, then 10 min. in 12% hypo. Rich Purple: 3 min. in common salt, 60 gr.; water, 20 oz.; then 10 min. in 12 $\frac{1}{2}$ % hypo.

### Collodion Printing Out Paper.

**Emulsion for Glossy Paper.**—(a) 4% collodion collodion, 620 c.c.; ether, 100 c.c.; alcohol (.796), 30 c.c. (b) Silver nitrate, 25 grams; distilled water, 25 c.c.; alcohol (.796), 120 c.c. (c) Calcium chloride crystals, 4 grams; distilled water, 4 c.c.; alcohol, 5 c.c. (d) Citric acid, 5 grams; distilled water, 5 c.c.; alcohol (.796), 30 c.c. (e) Castor oil solution (1 of oil in 2 of alcohol), 15 c.c.; glycerine solution (glycerine, 1; alcohol, 2), 15 c.c. (b), (c), (d) and (e) are added to (a) in this order with copious shaking. Gives paper especially suitable for separate toning baths.

Another.—(a) 4% collodion collodion, 670 c.c.; absolute ether, 120 c.c. (b) Silver nitrate, 24 grams; distilled water, 26 c.c.; alcohol (.796), 100 c.c. (c) Lithium chloride crystals, 2 grams; strontium chloride crystals, 2.5 grams; citric



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### (Collodion Printing Out Paper)

acid, 5 grams; distilled water, 10 c.c.; alcohol (.796), 50 c.c. (d) Castor oil solution (as above), 18 c.c.; glycerine solution (1 to 2), 18 c.c. Add (b), (c) and (d) to (a) with copious shaking, in this order. Suitable for combined toning and fixing bath.

*Emulsion for Matt Paper.*—(a) 4% collodion collodion, 600 c.c.; ether, 140 c.c.; methyl alcohol, 30 c.c. (b) Silver nitrate, 25 grams; distilled water, 28 c.c.; ethyl alcohol (.796), 100 c.c. (c) Calcium chloride crystals, 4 grams; distilled water, 1 c.c.; ethyl alcohol (.796), 420 c.c. (d) Citric acid, 5 grams; distilled water, 5 c.c.; ethyl alcohol (.796), 50 c.c. (e) Castor oil solution (as in 1), 12 c.c.; glycerine solution (1 to 2), 12 c.c. Mix in order. For use with a raw matt paper, e.g. matt baryta paper.

*Acetate Sulphocyanide Gold.*—(a) Sodium acetate, 840 gr.; distilled water, 40 oz. (b) Ammonium sulphocyanide, 360 gr.; distilled water, 40 oz.; gold chloride, 15 gr.; distilled water, 3½ oz. Make up 1 hour before required: (a), 20 oz.; (b), 5 oz.; (c), 1½ oz. Sodium tungstate in place of the acetate gives fine chestnut tones.

*Sulphocyanide Gold Toning.*—Ammonium sulphocyanide, 7½ gr.; gold chloride, 1 gr.; water, 10 oz.

*Borax Gold.*—Gold chloride, 1½ gr.; borax, 40 gr.; water, 20 oz. Use only when freshly made.

*Gold Platinum Toning (especially for matt paper).*—(a) Gold chloride, 1 gr.; sodium acetate, 30 gr.; water, 40 oz. (b) Potass. chloroplatinite, 1 gr.; phosphoric acid (acid phosph. dil. B. P.), 2¼ oz.; water, 40 oz. For olive black color, tone in (a) to red brown; for pure black, carry prints to purple in (a). In each case complete toning in (b). Wash prints between (a) and (b) in 3 changes of water. Use (a) once only. (b) can be used again and again until action is too slow.

*Platinum.*—Potassium chloroplatinite, 4 gr.; citric acid, 40 gr.; water, 10 oz. Make at least half an hour before use. Keep and use until exhausted.

*Reducing Toning Bath (for over-printed prints).*—Gold chloride, 1 gr.; hydrochloric acid, 100 minims; water, 20 oz. Stains at first; but in about 1 min. stains clear and toning begins.

*Glazing (Enamel Collodion Process).*—Soluble gun cotton, 50 gr.; alcohol, 4 oz.; sulphuric ether, 4 oz. Clean a glass plate with French chalk and coat with above collodion. As soon as set slide the plate face up into water in which the print to

### (Bromide Paper)

be glazed is floating—face down. Lift the pair out in contact, squeegee, and set to dry. When half dry, paste a backing paper to the print.

*Glazing Without Collodion (Paget Process).*—Do not dry the prints after washing. Lay them face down on well-cleaned plate glass (not prepared in any way); roll the back firmly several times with a roller squeegee, and leave to dry; or they may be dried by heat in a few minutes. When thoroughly dry, wet or well damp the back of the print in any way you please, and leave it for 5 min. Lift one corner of the print (if it is a large one, two adjacent corners are better) and pull steadily without stopping; the print will come off easily, and when dried again will have a highly glazed surface; not injured by wetting.

### Bromide Papers.

*Relative Exposures for Various Lights.*—The following exposures are recommended for bromide paper, for average negatives, at a distance of 18 in. from the source of light: To ordinary 5 ft. flat-flame gas burner, 6 sec.; to duplex paraffine or oil lamp with clear glass chimney, 5 sec.; to incandescent gas burner in good order, 2 sec.; to 16 candle incandescent electric, 3 sec.; to small acetylene burner, 2 sec. If after a trial exposure the print appears overexposed for the paper used, decrease the time one half. If underexposed, double the time.

*Slow and Rapid.*—Slow papers give plucky results from flat negatives; rapid papers give soft results from hard negatives. Amidol, ortol, and metol hydroquinone are the developers recommended for giving soft results from harsh originals.

*Bromide Paper.*—Gelatin, 42 gr.; bromide of potassium, 26 gr.; 'distilled water, 1 oz. Soak the gelatin in part of the water, and dissolve with heat on a water bath. When completely dissolved, add: Silver nitrate, 32 gr.; water, 1 oz.; to be added slowly, and with constant stirring. Digest at a temperature of 85° F. for an hour or more in the dark (this can be done conveniently by having the emulsion in a stoneware bottle). Pour out to set, then make into shreds by squeezing through the bottom of a coarse canvas or fine net bag. Put the shreds in a bag, and wash in 2 or 3 changes of water. Squeeze out the water, and dry the shreds between sheets of canvas, then remelt for coating. Coat on baryta-faced paper. The whole of the operations after the silver is added to the

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### (Bromide Paper)

gelatine (including coating, drying, and storing of the finished paper) must be conducted in darkness or in a dark-room light.

**Emulsion for Sepia Bromide Paper.**—Gelatine, 300 gr.; potassium bromide, 150 gr.; potassium iodide, 30 gr.; water, 6 oz.; nitric acid, 2 drops. Sensitize with silver nitrate, 200 gr.; distilled water, 6 oz. Digest, wash, coat, etc., as in paragraph above.

**Printing Out Silver Bromide Emulsion.**—(a) Collodion (2½ to 3%), 500 c.c. (b) Citric acid, 10 grams; alcohol, 40 c.c.; strontium bromide (10% solution), 4 c.c.; glycerine alcohol (1.1), 4 c.c. (c) Silver nitrate, 10 grams; water, q. s.; alcohol, 40 c.c. (d) Ether, 80 c.c. Dissolve the citric acid in the alcohol, add the bromide and glycerine mix. (a) and (b) together, then, in a deep yellow light, add (c). The silver nitrate should be dissolved by the aid of heat with as little water as possible, and then the alcohol added, and the mixture added in small quantities and with continuous shaking to the bromized collodion. Then add the ether. Allow to stand for a few minutes, filter and coat. A harder working emulsion can be obtained by adding 0.8 gram of calcium bicarbonate to the above quantity. Excellent results are obtainable by adding 0.4 to 0.5 gram of calcium chloride. The papers tone well in the usual baths, and print 3 times as fast as commercial printing out paper. There is not much loss in toning and fixing, except with the emulsion containing chromate.

**Bromide Paper (home made, in emergency).**—Float ordinary printing out paper for 3 min., face downward, on potassium bromide, 1 oz.; water, 19 oz. Dry, then use as a very slow bromide. Both sensitizing and drying must be done in safe dark-room light.

**Acid Bath (to follow oxalate).**—Acetic acid, 60 minims; water, 32 oz.

**Adurol.**—(a) Sodium sulphite, 200 gr.; potassium carbonate, 150 gr.; adurol, 25 gr.; water, 1 oz. (b) Potassium bromide, 10%. To use: (a), 1 oz.; (b), 5 drops; water, 5 oz.

**Adurol Metal.**—To give rather warmer blacks than adurol alone: (a) Metal, 10 gr.; sodium sulphite, 100 gr.; adurol, 24 gr.; water to make 4 oz. (b) Potassium carbonate, 200 gr.; water to make 4 oz. Commence with (a), 3 parts; (b), 1 part; after a minute's use, add more (b) if development is not rapid enough.

**Amidol.**—Amidol, 50 gr.; sodium sulphite, 650 gr.; potassium bromide, 10 gr.; water, 20 oz. Use within 3 days.

### (Bromide Paper)

**Azol.**—Azol, 30 minims; water to 2 oz. For soft effects: Azol, 50 to 60 minims; water to 2 oz. For more vigorous prints, soak in water for a minute before placing in the developer.

**Edinol.**—Edinol, 50 gr.; acetone sulphite, 250 gr.; sodium carbonate, 175 gr.; water, 10 oz. Or, Edinol, 50 gr.; sodium sulphite, 500 gr.; water, 10 oz.

**Hydroquinone Carbonate.**—(a) Hydroquinone, 60 gr.; sodium sulphite, 135 gr.; potassium bromide (10% solution), 14 oz.; water to 20 oz.; acidify with dilute sulphuric acid until it just reacts on litmus paper. (b) Sodium carbonate, 5 oz.; water, 30 oz. To use, take (a), 1 oz.; (b), 3 oz.

**Hydroquinone Eikonogen.**—(a) Hydroquinone, 40 gr.; eikonogen, 120 gr.; soda sulphite, 480 gr.; citric acid, 20 gr.; water, 20 oz. (b) Sodium carbonate crystals, 60 gr.; caustic soda, 30 gr.; potassium bromide, 5 gr.; water, 20 oz. Use (a), 1 oz.; (b), 1 oz.; water, 2 oz.

**Iron Developer (Citrate).**—Potassium oxalate, 2½ oz.; potassium citrate, 2½ oz.; water, 20 oz.; ferrous sulphate, 1½ oz.; water, 20 gr. For pure black tones.

**Iron Developer (Oxalate).**—(a) Potassium oxalate, 1 lb.; potassium bromide, 5 gr.; hot water, 48 oz. (b) Citric acid, 240 gr.; warm water, 32 oz.; iron proto-sulphate, 1 lb. Take (a), 6 oz.; and add (b), 1 oz.; not *vice versa*.

**Iron Developer. Various Tones by Development.**—(a) Potassium oxalate, 1 oz.; water, 3 oz. (b) Ferrous sulphate, 25 gr.; water, 1 oz.; citric acid, 2½ gr. (c) Potassium chloride, 65 gr.; water, 1 oz. (d) Potassium bromide, 48 gr.; water, 1 oz. For black tones: (a), 1 oz.; (b), ¼ oz.; (c), 30 minims; (d), 1 minim. Find the exposure which gives a good warm black with this, then vary for other colors. Thus, Brown: Exposure twice normal. (a), 1 oz.; (b), ¼ oz.; (c), ¼ oz.; (d), 2 or 3 minims. Purple: Exposure 2 to 2½ times. (a), 1 oz.; (b), ¼ oz.; (c), ¼ oz.; (d), 10 minims. Red: Exposure 3 to 4 times. (a), 1 oz.; (b), ¼ oz.; (c), ¾ oz.; (d), 10 minims. Yellow: Exposure, 6 to 8 times. (a), 1 oz.; (b), ¼ oz.; (c), 1 oz.; (d), 15 minims. Print dry to a colder tone than shown when wet.

**Metal.**—(a) Metal, 120 gr.; water, 24 oz. Dissolve, and add soda sulphite, 2½ oz.; potassium bromide, 15 gr.; and shake till dissolved. (b) Potassium carbonate, 350 gr.; water, 8 oz. (a), 3 oz.; (b), 1 oz.

**Metal Hydroquinone.**—Metal, 50 gr.; hydroquinone, 15 gr.; sodium sulphite,

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### (Bromide Paper)

500 gr.; potassium bromide, 10 gr.; potassium carbonate, 100 gr.; water, 20 oz. Dissolve metol first, and other salts in order named. Keeps well; can be diluted for use.

**Ortol.**—(a) Ortol, 1 oz.; potassium metabisulphite,  $\frac{1}{2}$  oz.; water, 60 oz. (b) Sodium carbonate (crystals), 12 oz.; sodium sulphite (crystals), 8 oz.; water, 60 oz. For use, 1 oz. (a); 1 oz. (b); 8 oz. of water.

**Rodinal.**—Rodinal, 25 minims; 10% potass. bromide solution, 2 minims; water, 3 oz.

**To Stop Metol Development.**—Salt, 1 oz.; water, 10 oz.

**Fixing Bath.**—Sodium hyposulphite, 4 oz.; water, 20 oz.

**Acid Hypo Fixing Bath.**—Hypo, 4 oz.; potassium metabisulphite, 200 gr.; water, 20 oz.

**For Bromide Prints** for 10 min., using fresh fixing bath for each batch.

**A Jet Black Developer for Bromide Paper.**—(a) Satrapol, 1 oz.; hot water, 64 oz.; sodium sulphite (desiccated), 5 oz. (b) Hydroquinone, 2 oz.; warm water, 64 oz.; sodium sulphite (desiccated), 5 oz. (c) Potassium carbonate, 16 oz.; water, 64 oz. To develop, take  $2\frac{1}{2}$  oz. of (a);  $2\frac{1}{2}$  oz. of (b);  $3\frac{1}{2}$  oz. of (c); 15 drops of a 10% solution of bromide of potassium, and 20 oz. of water. Hardener.—Common water, 40 oz.; sulphite of soda (desiccated), 6 oz.; powdered alum, 16 oz.; acetic acid, 40 oz. Mix in the order given: Hyposulphite of soda to test 80 on the argentometer. To every gallon of hypo add 16 oz. by measure, of hardener. This solution will answer for both bromide and chloride developing papers.

**Local Development.**—Commence with 3 solutions: (a) Normal weak developer; (b) 10% bromide of potassium; (c) glycerine, in separate vessels. Flow the developer over the paper until the image begins to appear, then lay the print on a sheet of glass, rinse in water, and paint over the parts you wish to restrain with bromide solution, then paint or flow developer over the whole. The glycerine may be used for restraining over wider areas: the bromide for small spaces.

**For Blue Black.**—Normal exposure, and amidol.

**For Black, Purple, Brown or Red Tones.**—Ammonium oxalate (10% solution), 170 minims; copper sulphate (10% solution), 24 minims; potassium ferricyanide (10% solution), 18 minims; oxalic acid (saturated solution), 6 minims; water, 1 oz. Leave

### (Bromide Paper)

until desired tone is reached; wash, fix in acid hypo. Remove pink stain (if any) with 1% ammonia.

**For Artist's Brown.**—3 to 6 times normal exposure; develop with first edinol formula. For pure brown, normal exposure and second edinol formula. Increase of exposure and increase of sulphite (to as much as 100 gr. per oz.) increase warmth of tone.

**For Various Colors.**—(a) Sodium sulphite, 120 parts; water, 300 parts; potassium carbonate, 90 parts; adurol, 15 parts. (b) Bromide of potassium, 10% solution. (c) Bromide of ammonium, 10% solution. (d) Carbonate of ammonium, 10% solution. For Black: Normal exposure, 2 oz. of (a), 10 drops of (b) and 9 oz. of water; time of development, 1 to 2 min. For Sepia: Exposure,  $1\frac{1}{2}$  to 3 times normal; 2 oz. of (a), 15 to 50 minims of (b) and 15 to 30 oz. of water. The warmth of the sepia depends on the amount of water and potassium bromide; development, 2 to 3 min. For Brown and Purplish Brown: Over-expose 3 to 6 times; 2 oz. of (a), 45 minims of (b), 45 to 90 minims of (c), 45 to 90 minims of (d), 20 to 30 oz. of water. Development, 5 to 10 min. For Brownish Red: Over-expose 6 times and develop in 2 oz. of (a), 45 minims of (b), 45 to 135 minims of (c),  $2\frac{1}{2}$  dr. of (d), 60 oz. of water. Development, 12 min. For Reddish: Over-expose 50 times and develop in 2 oz. of (a), 45 minims of (b), 3 dr. of (c), 3 dr. of (d), 100 oz. of water. Development, 15 to 30 min.

**Rusty Green Prints** from injudicious exposure or development are improved by toning in gold chloride, 1 gr.; acetate of soda, 20 gr.; water, 5 oz.

**Strong Prints for Flat Negatives.**—Expose fully and over-develop. Fix and wash. Place in bath made by adding 1 dr. of the following solution to 1 oz. of water: Potass. iodide, 40 gr.; iodine, 4 gr.; water, 1 oz. Remove prints when the whites become blue, and fix for 5 min.

**Developers and Toning.**—For hyposulphum toning, prints are best developed with amidol; synthol, rodinal and edinol are good; metol hydroquinone very unsatisfactory. For uranium, edinol, hydroquinone and ferrous oxalate are good; synthol, fair; metol hydroquinone, unsatisfactory; amidol gives stained lights. For copper, amidol is best; edinol, rodinal and pyro soda fairly good; hydroquinone, alone or with metol, unsatisfactory. C. Winthrop Somerville finds the best prints for toning are those de-

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### (Bromide Paper)

veloped to a blue black with: Metol, 100 gr.; hydroquinone, 50 gr.; sodium sulphite, 3 oz.; potass. carbonate,  $1\frac{1}{2}$  oz.; water, 80 oz.; with 10% of potass. bromide solution added as required.

**Toning with Platinum.**—Potass. chloroplatinite, 12 gr.; mercuric chloride, 6 gr.; citric acid, 54 gr.; water, 6 oz. (made fresh for use from stock solutions). Tones 24 half-plate prints, 3 at a time. Warm sepia tone with slight staining of the ground. For colder sepia and absence of stain, add from 5 to 25 minims of 10% potass. bromide solution. Apply with soft camel's-hair brush, placing print in a porcelain dish inclined at about  $60^\circ$ , so that the solution collects at the bottom. Go over print with brush, placing dish the other way up every 5 min. or so. After toning, wash for 10 min. Results, permanent.

**Sepia Tones by Reddevelopment.**—Develop, fix, wash. Then bleach in: Ferricyanide of potassium, 100 gr.; bromide of potassium, 100 gr.; water, 10 oz., until the shadows are nearly bleached away. Rinse, and darken in sulphide (not sulphite) of soda, 50 gr.; water, 10 oz. The print immediately changes to a rich sepia and then only requires a short washing. If blisters occur the sulphide bath must be weakened.

**Intensifier.**—Bleach in mercuric chloride (saturated solution), wash thoroughly, and develop in old ferrous oxalate or metol. Or, Bleach in: Copper sulphate, 200 gr.; potass. bromide, 200 gr.; water, 20 oz. Wash for 5 min.; redevelop in: (a) For prints weak from under-development, 10% silver nitrate solution, 50 minims; water, 3 oz. (b) For prints weak from over-exposure, Rodinal, 50 minims; water, 3 oz.

**Hypo Alum or "Boiling" Process.**—Rich browns and sepias; believed to be permanent. Hypo, 10 oz.; alum (ground), 2 oz.; granulated sugar, 2 oz.; water, 70 oz. Dissolve hypo; add alum slowly. Do not filter, but ripen (a) by standing for 24 hours, (b) by heating to  $130^\circ$  F. a couple of times and allowing to cool, or (c) by putting in some waste bromide paper. Fix and wash prints; place in above bath, cold, for a minute or two, then transfer to above bath, hot,  $130$  to  $140^\circ$  F. is right for most papers; but keep the solution on a water bath and as hot as experience has shown that the particular paper will stand. After toning, place in alum, 2 oz.; water, 70 oz., for a minute or so. Wash well.

**Brown to Red.**—(a) Uranium nitrate, 45 gr.; water, 10 oz. (b) Potassium

### (Bromide Paper)

ferricyanide, 40 gr.; water, 10 oz. Take equal volumes of (a) and (b), and add 20 minims of glacial acetic acid to each oz. of mixture. Prints must be free from hypo. After toning, wash in several changes of still water, till the high lights are white. Blot off and dry. Yellow stain in the whites is removed by ammonium sulphocyanide solution (2 gr. per oz.).

**To Stop Uranium Toning.**—Immerse in large basin of still water.

**Blue and Bluish Green.**—Make 10% solution of (a) uranium nitrate; (b) ferric ammonium citrate; (c) potassium ferricyanide; and (d) nitric acid. Take (a), 1 vol.; (b), 1 vol.; (d), 2 vols.; water to 40 vols. Wash afterwards until the lights are clear.

**Blue or Purple.**—(a) Ferric ammonium sulphate, 10 gr.; hydrochloric acid, 1 c.c.; water, 100 c.c. (b) Potassium ferricyanide, 2 grams; water, 250 c.c. To use: (a), 10 c.c.; (b), 20 c.c.; hydrochloric acid, 2 c.c. water, 200 c.c. For purple tones, after toning in above, rinse, and wash in a water to which a few drops of ammonium hydroxide have been added.

**Blue.**—10% solution ferric ammonium citrate,  $\frac{1}{2}$  oz.; 10% solution potassium ferricyanide,  $\frac{1}{2}$  oz.; 10% solution acetic acid, 5 oz. Immerse print until dark greenish blue. Wash until the lights are clear of yellow stain. About doubles the density of print. Rather weak prints should be made, developed, fixed, washed and dried in the usual way. More brilliant blue is secured by fixing in a hypo bath after the above treatment.

**Green.**—Tone for few seconds only in the above "blue" formula. Rinse, and transfer to chromic acid solution (45 gr. per oz.). Remove yellow chromate stain in alum solution, and wash thoroughly. Or, tone (about 2 minutes) in ferric chloride, 2 gr.; oxalic acid (saturated solution), 120 minims; vanadium chloride, 4 gr.; nitric acid, 10 minims; water to make 1 oz.; to which add slowly, with shaking, potassium ferricyanide, 1 to 8 gr.; water, 1 oz. Wash until whites are free from blue color, fix in acid hypo until all blue color is discharged; then wash until green returns completely.

**Green.**—Potassium ferricyanide, 6 grams; lead nitrate, 4 grams; water to 100 c.c. Soak in this until the image has been acted upon thoroughly, wash thoroughly, and immerse in: Cobalt chloride, 10 grams; hydrochloric acid, 30 c.c.; water to 100 c.c.

**Acid-Hypo Bath for Fixing and Toning.**—Hypo, 1 oz.; boric acid, 50 gr.; water, 10 oz.

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### (Gaslight Papers)

**Red (tonable to blue).**—Wash well. Bleach in potass. bichromate, 10 gr.; hydrochloric acid, 2 drops; water, 1 oz. Again wash well, and flood with Schlippe's salt, 15 gr.; water, 1 oz. After washing, print can be toned in sulphocyanide and gold bath.

**Warm Purple and Brown.**—Develop, fix, and wash well, then tone in (a) strong gold and sulphocyanide bath, with 2 gr. of gold to the oz.; or (b) bleach in bichromate of potash, 4 parts; hydrochloric acid, 2 parts; water to 100 parts. Wash well, dry, expose to daylight for a few minutes, then redevelop with hydroquinone, 10 gr.; sodium sulphite, 100 gr.; acetone, 50 to 75 minims; water, 2 oz., for purple tones. With 6 to 8 oz. of water the tones will be brown to red.

**Schlippe's Salt and Sulphide.**—Bleach in potassium bichromate, 90 gr.; sulphuric acid, 200 minims; common salt, 1 oz.; water, 10 oz. Tone in sodium sulphide solution, 3 dr.; Schlippe's salt solution, 1 dr.; water, 5 oz. Vary by increasing one solution and decreasing the other. To sulphide, 1 dr.; Schlippe, 3 dr., to vary the tone.

**Thiomolybdate Toning.**—Bleach in potassium bichromate, 90 gr.; sulphuric acid, 200 minims; common salt, 1 oz.; water, 10 oz. Tone in ammonium thiomolybdate (1% solution), 60 minims; water, 1 oz.; ammonia (.880), 5 minims. Rinse. Place in 5% bath of ammonia for 5 minutes.

**For Red Chalk Tones.**—After sulphidizing (as above), tone in ammonium sulphocyanide, 100 gr.; gold chloride, 10 gr.; water, 10 fl.oz.

**For Various Sepia Tones.**—Potassium ferricyanide, 10 gr.; water, 10 oz.; and (a) common salt, 20 gr.; or (b) potassium iodide, 10 gr.; or (c) potassium bromide, 10 gr.; or (d) strong liquor ammonia (.880), 20 minims. Bleach the print in (a) for coldest, (b) for medium, or (c) for warm sepia. Wash well for 3 to 5 minutes, then place in ammonium sulphide, 1 oz.; water, 100 oz.; for 2 minutes.

### "Gaslight" Papers.

**Aduro Developer.**—Aduro, 20 gr.; soda sulphite, 200 gr.; soda carbonate, 200 gr.; potassium bromide, 5 gr.; water to 10 oz. Cold tones with 1 in. magnesium ribbon burnt at 1 ft. from average negative. Develops in about 1 minute. Or, with 25 gr. of bromide, gives warm tones with 6 in. of magnesium at 1 ft. Develops in about 4 minutes.

**Amidol.**—Sodium sulphite, 1 oz.; ami-

### (Gaslight Papers)

dol, 50 gr.; potassium bromide (10% solution), 10 minims; water to make 20 fl.oz. Warm the water, dissolve in order given, and use when cold.

**Adol.** 40 minims; potassium bromide (10% solution), 2 minims; water to 1 oz. For strong, rich blacks. For soft gray effects double the amount of water, and remove the print to fixing bath soon after appearance of image.

**Edinol.**—Soda sulphite, 1½ oz.; water, 20 oz.; edinol, 90 gr.; acetone, 2 oz.; 10% solution of potassium bromide, 20 to 30 drops. Gives vigorous pure black print from a flat negative.

**Hydroquinone.** 20 gr.; sodium sulphite, 100 gr.; sodium carbonate crystals, 200 gr.; potassium bromide solution, 20 to 80 drops; water, 10 oz.

**Kachin (Warm Tones).**—Kachin, 40 gr.; soda sulphite, 250 gr.; soda carbonate crystals, 350 gr.; potassium bromide, 2 gr.; water to 10 oz. For warmer tones: Solution as above, 1 oz.; water, ½ oz.; 10% potassium bromide solution, 20 drops.

**Metal.** 25 gr.; soda sulphite, 250 gr.; sodium carbonate crystals, 250 gr.; 10% potassium bromide solution, 20 to 120 drops; water, 10 oz.

**\*Metal-Hydroquinone.**—Metal, 25 gr.; hydroquinone, 45 gr.; sodium sulphite, 1 oz.; sodium carbonate, 500 gr.; potassium bromide, 6 gr.; water, 20 oz. Or, water (boiled or distilled), 20 oz.; metal, 15 gr.; sodium sulphite (cryst.), 9 dr.; hydroquinone, 60 gr.; sodium carbonate, 18 dr.; potassium bromide, 3 gr. For soft results, increase exposure and double the quantity of water. For more contrast, add a few drops of 10% potassium bromide to each ounce.

**M. Q. Developer.**—Water, 10 oz.; metal, 7 gr.; soda sulphite, ½ oz.; hydroquinone, 30 gr.; soda carbonate cryst., 400 gr.; 10% potassium bromide solution, 10 drops.

**Radinal.**—Stock solution, 1 fl.oz.; water, 20 oz.; potassium bromide (10% solution), 25 minims.

**Synthol.**—Water, 10 oz.; soda sulphite, 150 gr.; synthol, 25 gr.; potassium bromide (10% solution), 20 drops.

**For Red and Sepia Tones.**—(a) Water, 20 oz.; sulphuric acid, 5 minims; iron protosulphate, 2½ oz. Should be pale apple-green color. (b) Soda citrate, 5 oz.; citric acid, 4 oz.; water, 20 oz. (a), 1 oz.; (b), 2 oz. Exposure on Velox, about 3 or 4 in. magnesium.

**Brown Tones.**—(a) Pyro, 30 gr.; po-

\**Natropo* can be substituted for metal.

## Photography

### (Ferro-Prussiate Papers)

tassium metabisulphite, 30 gr.; ammonium bromide, 30 gr.; water, 10 oz. (b) Ammonia (.880), 75 minims; water, 10 oz. (a),  $\frac{1}{2}$  oz.; (b),  $\frac{1}{2}$  oz.; water, 1 oz.; adding more of (a) and (b) as time goes on. Develops slowly, so shield print from light.

**Warm Tones (Hydroquinone).**—Pure warm water, 1 oz.; sodium sulphite, 55 gr.; hydroquinone, 7 gr.; potassium bromide,  $4\frac{1}{2}$  gr.; sodium carbonate, 120 gr. Dissolve in the order given. For different colors give the normal exposure (1), or multiples of the normal, as given in the first figure, and dilute with the number of volumes of water given as the second figure after each color: Greenish black, 1, 5; olive, 2, 5; sepia, 3, 10; brown, 4, 10; red-brown, 6, 20; yellow-brown, 8, 20; red, 5, 30; orange, 10, 30; yellow, 20, 40.

**Warm Tones, Rodinal-Carbonate.**—Ammonium carbonate,  $\frac{1}{2}$  oz.; ammonium bromide,  $\frac{1}{2}$  oz.; water, 10 f.oz. For warm sepia, give 6 times normal exposure, and take rodinal, 1 dr.; carbonate solution,  $1\frac{1}{2}$  dr.; water, 5 oz. For red, 10 times normal; rodinal, 1 dr.; carbonate solution,  $1\frac{1}{4}$  dr.; water, 12 to 15 f.oz.

**Pyro-Acetone.**—Pyro, 90 gr.; acetone sulphite, 1 oz.; sodium carbonate, 2 oz.; potassium bromide (10% solution), 10 to 20 minims; water, 10 f.oz.

**Amount of Bromide** is varied according to the class of negative from which the print is made. To increase contrast in prints, use more bromide. For soft prints from hard negatives, less bromide.

**Warm Tones.**—General rule: For warm tones, increase the exposure and increase the amount of potassium bromide.

**Acid Fixing Bath.**—Hypo, 16 oz.; water, 64 oz.; to which add solution of soda sulphite, 1 oz.; glacial acetic acid,  $1\frac{1}{2}$  oz.; alum, 1 oz., in  $14\frac{1}{2}$  oz. of water. Or, Hypo, 8 oz.; water to 30 oz., and add solution of soda sulphite, 2 oz.; alum,  $\frac{1}{2}$  oz., and sulphuric acid,  $\frac{1}{4}$  oz., in 10 oz. of water.

**Ferro-Prussiate or Blue Print and Heliographic Processes, Etc.**

**Ferro-Prussiate with Brown Citrate.**—(a) Ferric ammonium citrate (brown), 80 gr.; water, 1 oz. (b) Potassium ferricyanide, 60 gr.; water, 1 oz. Mix; keep in dark; filter before use.

**Ferro-Prussiate with Green Citrate.**—(a) Ferric ammonium citrate (green), 110 gr.; water, 1 oz. (b) Potassium ferricyanide, 40 gr.; water, 1 oz. Mix, and use as above.

### (Ferro-Prussiate Papers)

**Potassium Ferricyanide** (not ferrocyanide) should be in clear, ruby-red crystals; if otherwise, rinse with water (drying between blotting paper) before weighing.

**Better Keeping Properties** of papers as prepared above are produced by adding  $\frac{1}{2}$  gr. per oz. of potassium bichromate to the mixed solution.

**Ferro-Prussiate Rapid Sensitizer.**—Ferric ammonium citrate (green), 110 gr.; uranic nitrate, 35 gr.; water, 1 oz. Print to faint image, develop on 5% ferricyanide solution.

**To Make Blue Prints Green.**—1.—Make 4 solutions, as follows: (a) water, 8 oz., and a crystal of nitrate of silver as big as a pea. (b) Hydrochloric acid, 1 oz., and water, 8 oz. (c) Pour a solution of iodide of potassium (iodide of potassium, 1 oz., and water, 8 oz.) into a saturated solution of bichloride of mercury until the red precipitate is just dissolved, and then add 4 times as much water as the resulting solution. (d) Water, 16 oz., and iodide of potassium, 1 dr. Then take the blue print and bleach it with (a), when the image will become pale slate color, or sometimes a pale yellow. Then wash thoroughly, and immerse the print in (b), when the image will again become blue. Then, without washing, immerse the print in (c), when the image will become green, but the "whites" will be of a yellow tint. Then put the print in (b) again, without washing. Then wash, and pour (d) over the print to purify the whites and to give the green image a bluer tint; but do not leave print in this solution too long, as it has a tendency to make the print blue again.

**2.—Toning to Greenish Black.**—Borax, 30 gr.; water, 1 oz. Add sulphuric acid, drop by drop, till the liquor just reddens litmus paper; then 10% ammonia solution till the red color just commences to change. Now add 4 gr. of powdered catechu. Shake well, and filter.

**Brown to Black Tones.**—1.—Bleach dry print in ammonia solution, 6 minims per oz.; rinse, and place in tannic-acid solution, 9 gr. per oz.

**2.**—The following is said to be a practical manner of turning blue prints to a rich brown color: A piece of caustic soda about the size of a bean is dissolved in 5 oz. of water, and the blue print immersed in it, on which it will take on an orange-yellow color. When the blue has entirely left the print it should be washed thoroughly and immersed in a bath composed of 8 oz. of water in which has been dis-

## Photography

### (Blue Process)

solved a heaping teaspoonful of tannic acid. The prints, in this bath, will assume a brown color that may be carried to almost any tone, after which they must again be thoroughly washed, and allowed to dry.

3.—Borax,  $2\frac{1}{2}$  oz.; hot water, 38 oz. When cool, add sulphuric acid, in small quantities, until the blue litmus paper turns slightly red, then add a few drops of ammonia until the alkaline reaction appears and the red litmus paper turns blue. Then add to the solution 154 gr. of red crude gum catechu. Allow it to dissolve, with occasional stirring. The solution will keep indefinitely. After the print has been washed out in the usual way, immerse it in the above bath a minute or so longer than it appears when the desired tone is reached. An olive brown or a blackish brown is the result.

**Black Tones.**—Lagrange's process: Bleach in silver nitrate, 9 gr.; water, 1 oz. Wash well, fume with ammonia, expose to light, and develop with ferrous oxalate.

**Lilac Tones**, which, however, alter by light and damp, are produced by soaking the finished print in a 35% solution of ammonium sulphocyanide containing a little lead acetate.

**Brightening the Color.**—Use alum solution ( $2\frac{1}{2}\%$ ) or oxalic acid (3% solution).

**Intensification** is not satisfactory. A solution of ferric chloride (2 gr. per oz.) may be tried.

**Reduction** can be done by longer washing in water, or by treating in a weak solution of caustic potash until the lines become clear; then placing in a weak hydrochloric acid, afterward well washing.

**A Blue Process.**—M. Makahara, at the convention of the Japanese photographers, held in Tokio, exhibited some blue prints of rare beauty. The process by which they were obtained was given as follows: A strongly sized paper is necessary. Dissolve 15 grams of gum arabic in 110 c.c. of hot water; while hot, add tartaric acid, 2 grams; chloride of sodium, 9 grams; sulphate of iron, 10 grams; perchloride of iron, 15 grams. The mixture is applied with a sponge to the paper, the sponge then squeezed out, and the excess of liquid removed; in fact, as much as possible is removed. Printing is a little longer than for albumen paper; the yellow of the sensitive paper turns white in printing. The prints are developed rapidly with gallic acid, then washed and sponged.

### (Sepia Process)

**Titles** on blue prints can be written with potassium oxalate solution (75 gr. per oz.), thickened with gum.

**Fogged Blue Prints** are due to old paper, insufficient sizing, or too much ferricyanide in the sensitizer.

**Good Brown Prints Without Toning.**—Size with arrowroot, 90 gr.; cold water, 5 oz., rubbed into a cream; and add glucose, 20 gr.; hot water, 5 oz. Mix well, and boil for 2 minutes. When cool, soak the paper until saturated, and hang up to dry. Sensitizer: Nelson's gelatine, 6 gr.; water, 1 oz. Swell in cold water, melt on water bath, and add, in the following order: Tartaric acid, 8 gr.; silver nitrate, 9 gr.; ammonio-citrate of iron, 40 gr. A subdued light should be used, and the mixture filtered. Printed in bright light until slightly darker than ordinary printing out paper. Wash for 5 minutes, and immerse in a  $2\frac{1}{2}\%$  solution of hypo until the desired color is obtained. Wash and dry.

**Kallitype.**—Sensitizer: Ferric oxalate, 75 gr.; hot water, 1 oz.; oxalic acid, 5 to 10 gr. Dissolve, filter, cool, and add silver nitrate, 30 gr. Keeps in the dark. Or, Standard iron solution (see **Platinum Printing**), 400 minims; silver nitrate, 30 gr.; water to 1 oz. Developers: For black tones, borax, 44 gr.; Rochelle salt, 35 gr.; water, 1 oz.; potassium bichromate (5 gr. per oz.) solution, 45 to 60 minims; 10 oz. for 5 or 6 doz. plates. For purple, borax, 12 gr.; Rochelle salt, 45 gr.; water, 1 oz.; potassium bichromate (5 gr. per oz.) solution, 45 to 60 minims. For sepia, Rochelle salt, 22 gr.; water, 1 oz.; potassium bichromate solution, 25 to 30 minims. Fixer: Ammonia (.880), 60 minims; water, 10 oz. Reducer: Hydrobromic acid, 35 minims; water, 1 oz. Clears up high lights of overdone prints. When reduced enough, rinse, place in hypo 5 minutes, and wash.

**Sepia Paper (white lines on brown ground from drawing).**—(a) Green ferric ammonium citrate, 110 gr.; water, 1 oz. (b) Tartaric acid, 20 gr.; water, 1 oz. (c) Silver nitrate, 45 gr.; water, 1 oz. (d) Swell gelatine, 30 gr., in 1 oz. of water, and make fluid by heat. Place (d) fluid in cup, add (a) and (b), and then (c), drop by drop. Apply warm mixture with camel's-hair brush. Wash prints, and fix in hypo (10 gr. per oz.) for minute or two only. Wash in plain water.

**One-Solution Sepia Sensitizer.**—Silver nitrate, 55 gr., in water, 4 to 5 dr. Add ammonia, drop by drop, to just redissolve

## Photography

### (Black Prints)

white precipitate; then add dilute sulphuric acid until odor of ammonia almost entirely disappears. Now add 40 gr. of green ferric ammonium citrate in 6 dr. of water. Keep in the dark, in stoppered bottle. Fix prints in hypo, 100 gr.; soda sulphite, 50 gr.; water, 7 oz.

**Pellet Process (blue lines on white ground from drawing).**—(a) Gum arabic, 90 gr.; water, 1 oz. (b) Ferric ammonium citrate (brown), 220 gr.; water, 1 oz. (c) Ferric chloride (cryst.), 220 gr.; water, 1 oz. (a) keeps a few days; (b) and (c) for weeks. Sensitizer: Add 8 parts of (b) and 5 parts of (c), in this order, to 10 parts of (a), little by little, with shaking. Use after a few hours. Keeps for a day or two. Developer: Potassium ferrocyanide, 1 oz.; warm water, 10 oz. Use not colder than 60° F. Acid bath, sulphuric acid (sp. gr., 1.98), 1½ oz.; water, 40 oz.; or hydrochloric acid, 4 oz.; water, 40 oz.

**Ferrogallie Process (black lines on white ground from drawing).**—Gum arabic, 1 oz.; ferric chloride, ¾ oz.; tartaric acid, ½ oz.; basic ferric sulphate (Monsell's salt), ½ oz.; water, 15 oz. Mix in this order. Developer: Gallie acid, 2 oz.; alum, 2 oz.; water, 130 oz.

**Aniline Process.**—Sensitize hard paper on potassium bichromate, 1 oz.; phosphoric acid solution (1.24), 10 oz.; water, 10 oz. Expose about 3 minutes, under tracing, in summer light. Develop by vapor in a box, on floor of which is dropped (on blotting paper) aniline, 1 part; benzine, 10 parts.

**Process for Red Pictures.**—Float the papers for 4 minutes in the preceding bath of nitrate of uranium, drain, and dry. Next expose beneath a negative for 8 or 10 minutes, then wash, and immerse in a bath of ferricyanide of potash, 30 gr.; water, 3 oz. In a few minutes the picture will appear, of a red color, which is fixed by washing thoroughly in water.

**Process for Green Pictures.**—Immerse the red picture, before it is dry, in a solution of sesquichloride of iron, 30 gr.; distilled water, 3 oz. The tone will soon change to green; fix in water, wash, and dry before the fire.

**Process for Violet Pictures.**—Float the paper for 3 or 4 minutes on a bath of water, 2 oz.; nitrate of uranium, 2 dr.; chloride of gold, 2 gr. Afterward take them out, and dry. An exposure of 10 or 15 minutes will cause the necessary reduction; the picture has a beautiful violet color, consisting of metallic gold. Wash and dry.

**Black Prints.**—A black process is given

### (Black Prints)

in the *Photocopia* of A. Fisch. The process is technically known as heliography, is simple and inexpensive, while the prints are ink black, and are made from drawings, or positives and negatives. We owe this process to Poitevin, but it has been slightly improved.

**Sensitizing Solution.**—Dissolve separately: (1) Gum arabic, 13 dr.; water, 17 oz. (2) Tartaric acid, 13 dr.; water, 6 oz. 6 dr. (3) Persulphate of iron, 8 dr.; water, 6 oz. 6 dr. The third solution is poured into the second, well agitated, and then these two solutions, united, are added to the first, continually stirring. When the mixture is complete, add slowly, still stirring, 100 c.c. (3 fl.oz. 3 dr.) of liquid acid perchloride of iron at 45° B. Filter into a bottle, and keep away from the light. It keeps well for a very long time. Select a paper that is very strong, well sized, and as little porous as possible. By means of a large brush or sponge apply the sensitizing liquid very equally in very thin and smooth coats; then dry as rapidly as possible with heat, without exceeding, however, a temperature of 55° C. (131° F.). The paper should dry in a dark place, and be kept away from light and dampness. Notwithstanding all these precautions, it does not keep very long. It should be of a yellow color.

**Printing.**—The tracing, made with very black ink, is placed in the printing frame, the drawing in direct contact with the glass; then place over it the sensitized paper, the prepared side in contact with the back of the tracing. The progress of insulation is sufficiently seen on the sensitized paper during the exposure. From yellow that it was it should become perfectly white in the clear portions; that is to say, upon which there is no drawing of the transfer or positive cliché that is to be copied; this is ascertained by raising from time to time the shutter of the frame. The exposure lasts 10 to 12 minutes in the sun; in summer less, in winter more. When the exposure is ended remove the print from the frame, and it should show a yellow drawing upon a white ground. If in the sensitizing bath a few cubic centimeters of a rather highly concentrated solution of sulphocyanide of potassium have been added, the bath becomes blood red, and colors paper the same. In this case the print also whitens during exposure, but then the image, instead of being yellow, is red on a white ground. This substance, however, is, if we may so speak, inert, or without any other action; it is very fugi-



## Photography

### (Platinum Printing)

tive, and even disappears in a short time; it has no other use, therefore, than to render the drawing or the image more visible after exposure.

**Developing the Prints.**—When the print has been sufficiently exposed it is taken from the press, the frame and floated for a minute in the following solution, so that the side upon which is the image should alone be in contact with the surface of the liquid, avoiding air bubbles between the two surfaces. The developing bath is composed as follows: Gallic acid (or tannin), 31 to 46 gr.; oxalic acid, 1¼ gr.; water, 34 oz. In this bath the orange-yellow or red lines are changed into gallate or tannate of iron, and form, consequently, a veritable black writing ink, as permanent as it. The print is then plunged into ordinary water, well rinsed, dried, and the print is now finished. The violet-black lines become darker in drying, but, unfortunately, the ground which appears of a pure white often acquires, in drying, a light violet tint. For prints with half tones this is of no importance; but for the reproduction of plans, for example, it is very objectionable.

### Platinum and Kindred Processes.

**Platinum Paper, From the Iron Salt to the Finished Print, By A. J. Jarman.**—The many failures that have been experienced in attempting to make platinum paper have been caused by the iron salt or salts being imperfect. The only way to insure success is to prepare the iron salt (ferric oxalate) oneself, taking considerable care in every stage of the process, both in the manipulation and in operating under a non-actinic light in the formation of this highly sensitive salt.

**Preparing the Hydrated Peroxide of Iron.**—1 lb. (16 oz.) of perchloride of iron is dissolved in 1½ gal. of boiling water, stirring vigorously with a glass rod, or a stout strip of hard rubber (a 2-gal. stoneware crock is best suited for the purpose). As soon as the perchloride has completely dissolved, add gradually, 14 oz. of strong aqua ammonia, a little at a time, stirring well during this addition. In a very short time the mixture will thicken up with a heavy mass of the hydrated peroxide; stirring may now cease, and the precipitate be allowed to subside. In about 1 hour, the clear liquid must be very carefully decanted, so as not to disturb the precipitate. The crock must now be filled with clean cold water, the mixture stirred well, and allowed to subside again; several hours will be re-

### (Platinum Printing)

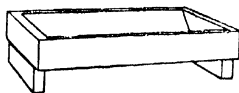
quired for this subsidence, when the operation of pouring off the clear portion and refilling and stirring must be repeated for 2 or 3 days, until upon testing a portion of the clear waste water in a test tube, no milkiness is produced by adding a few drops of a solution of nitrate of silver, 30 gr. to 1 oz. of distilled water. The peroxide must now be poured into a strong filter paper, fitted into a large glass funnel, with a piece of absorbent cotton drawn out like a cobweb, and placed over the apex of the filter paper; this is to strengthen the filter paper at that part, so as to prevent the paper breaking and causing a loss of the peroxide. As soon as filtration has taken place, fill the funnel to the brim with distilled water; at the end of 24 hours the precipitate must be cut out with a strip of glass, placed in the clean 1-gal. crock, and ½ lb. of chemically pure oxalic acid added with 10 oz. of distilled water. This and all after operations must be carried out under non-actinic light. This mixture must be stirred occasionally during 4 or 5 days. The forming of ferric oxalate now takes place. A very important point comes in here,—*always keep the peroxide in excess*, allowing a sediment to remain at the bottom of the crock; this will make the ferric oxalate as neutral as it is possible to get it. After 5 days, pour some of this rich, greenish-brown liquid into a test glass, test its strength with an argentometer (the same kind of instrument that used to be employed to test the strength of nitrate of silver solutions). It will be found to register at 70, if the operations have been carried out as described. Allow the liquid to subside, then decant, or draw the clear liquid off with a glass syphon into an amber-colored bottle, and label this "Ferric oxalate solution, C.P., 70 hydrometer test." This is the iron salt that is necessary for making platinum paper. The following chemical solutions must be made up as directed, ready for use and marked A, B, C, D, E, F.: Solution A, ferric oxalate; solution B, ferric chlorate, made by mixing 2 oz. of A with ½ oz. of potassium chlorate solution containing 1 dr. of potassium chlorate to 5 oz. of water. C, chloroplatinite of potassium, consisting of 1 oz. of the salt, in 10 oz. of hot distilled water. Allow to become cold. D, 1 oz. of nitrate of lead C. P. dissolved in 10 oz. of boiling water; in fact, boiled in a glass flask until the salt is dissolved. Allow to become cold. E, a saturated solution of oxalic acid. F, a thick solution of gum arabic with a few

## Photography

### (Platinum Printing)

drops of a 5% solution of carbolic acid added.

**Preparation of the Paper.**—Papers both smooth and rough can be procured at art stores that will answer well for the purpose of hand-prepared platinum paper. A suitable wooden trough should be made, as shown in the illustration, so shaped

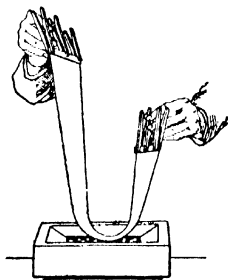


The Coating Trough

that the liquid resides in the center. Both for convenience and economy coat the inside of the trough with 2 coatings of shellac varnish. Cut the paper into strips, say 8 or 10 in. wide and 20 or 25 in. long, prepare some wooden strips  $\frac{1}{2}$  inch wide, 10 in. long, and  $\frac{1}{8}$  in. thick, varnish these with shellac varnish; also procure about 6 doz. wood clips (the kind that is usually employed for photographic use), making up a suitable drying closet, in which the coated sheets of paper can be dried by the aid of a gas stove, also fit up another closet lined with blotting paper, which must be well soaked with water, in which the sheets of paper must be suspended, previous to coating, to dampen the paper, to prevent air-bubbles, and cause even coating. Take the strips of paper, put a light pencil mark upon the back, then place one of the wooden strips at the top of the paper, clip it with 3 clips, fit the bottom end of the paper in like manner, prepare as many sheets as required in the same way, suspend them in the damping box for a short time, and while they are becoming dampened prepare the following mixture for coating: **The Sensitizing Solution.**—Under orange-colored light mix in rotation.—A, 3 oz.; B, 6 f.dr.; C, 3 oz.; D, 3 dr.; E, 30 drops; F, 2 dr. Shake this well in an amber-colored wine bottle, then filter through a tuft of absorbent cotton pressed moderately in the neck of a 4-in. glass funnel. Allow the liquid to fall into a wide-mouth, amber-colored bottle with a strip of glass so placed that the liquid falls upon the sloping strip; this will prevent air-bubbles being formed. When filtered, pour the liquid into the coating trough, take one of the sheets of dampened paper, bend it like the letter J, lower the left hand so that the paper touches the liquid, then lower the right

### (Platinum Printing)

hand, at the same time lift the left hand, allowing the bent surface of the paper to pass over the liquid, return the paper over the liquid by reversing the motion of the hands, lift the paper, drain the excess of the liquid from the lower corner against the side of the trough, wipe the excess from the lower end with a quill camel's-hair brush, then suspend it to dry in the heated closet; the temperature should be  $110^{\circ}$  F., not higher. Treat all the sheets of paper in like manner; when dry, remove them and lay aside to cool, then repeat the coating, drain, brush off, and dry a second time. When dry, trim off the ends, cut to size, place them carefully rolled and wrapped in a tin case in which a small piece of chloride of calcium has been placed well wrapped in porous paper, close the tin to keep out air until ready for use. The balance of sensitizing solution should be kept in an amber-colored bottle for future use, mixed with new solution for another coating.



Coating the Paper

**Printing the Image.**—Take any suitable negative, place on the paper prepared side upon the film, cover the front of the frame with tissue paper, expose in bright light until the image is printed to the usual depth that platinum prints are made. A trial upon a small piece of paper may be made first of all, then develop in the following solution, which should not be higher in temperature than  $70^{\circ}$  F., in fact at the usual daily temperature, as the paper is intended for cold development: Developer.—Potassium oxalate, neutral,  $6\frac{1}{2}$  oz.; sodium phosphate,  $1\frac{1}{2}$  oz.; hot water, 56 oz. Make this in a stoneware crock, stir well with a glass rod, allow to become cold, filter,

## Photography

### (Platinum Printing)

then use without dilution. Upon inserting the print it will rapidly develop to full density, when it must be placed at once into a clearing acid bath composed of C. P. hydrochloric acid, 1 oz. to 50 oz. of water, allowed to remain for 5 min., then placed in a second bath of like proportions, and a third in which the prints may remain for 10 min. 1 oz. of chloride of calcium may be placed in the second clearing bath in addition to the hydrochloric acid; this addition is advantageous in the use of all kinds of black platinum prints. After the third acid bath, the prints must be well washed for half an hour, when they may be dried, trimmed and mounted. The prints, when dry, will vie in quality with any platinum paper for cold development, and the paper being freshly made, is capable of yielding prints of exceptional beauty. It will be observed, as is the case with all makes of black print platinum paper, that after a number of prints have been developed, the resultant pictures are more brilliant, due to an excess of platinum being dissolved in the developer. For each day's working do not throw away the first-made solution, but add a fresh supply of new developer to that used the day before. This method is not only economical, it is capable of yielding the best prints possible.

**Water Developed Platinum Paper** can be made with the same chemicals, slightly modified. Having the ferric oxalate made perfectly, those who wish to make some platinum paper for development in hot water can do so by coating some paper with the following solution: Ferric oxalate solution, 4 oz.; ferric chlorate, 3 dr.; chloroplatinite of potassium solution, 3 oz.; nitrate of lead solution, 3 dr.; potassium oxalate solution (a saturated solution of potassium oxalate), 4 dr.; oxalic acid solution, 2 dr.; gum arabic solution, 1 dr. Filter as described, coat the paper, and dry. When prints are made upon this paper they look more pale than the ordinary. When the prints are made, pour some hot water into a clean tray, dip the print boldly into this; the image will develop instantaneously. Curious to say, prints made upon this kind of paper will develop themselves if left in a damp place away from actinic light; the image is well brought out in from 12 to 24 hours, or development can be made to take place by placing the print in the vapor issuing from the spout of a tea kettle. By this means some parts of the print can be developed more than the rest, in fact, local development of a platinum print is

### (Platinum Printing)

easily accomplished by this simple means. If a person has to travel and cannot carry a stock of hydrochloric acid with him, a solution of citric acid or oxalic acid can be used for clearing in the same proportions as for hydrochloric, only the second is apt to poison the fingers, unless they be washed in lime water after use, although the writer has used oxalic acid exclusively as a clearing agent in the early eighties in the hot bath process. Whenever possible, hydrochloric acid is preferable. It is necessary when preparing the hydrated peroxide of iron to be sure that the perchloride of iron is of a very pure variety. That of German manufacture sold in 1 lb. bottles is excellent. The perchloride is sometimes called under the old nomenclature, "Sesquichloride of iron." In any case it must be of that variety that has been super-oxidized by nitric acid. The resulting hydrated peroxide will then be of a light brown color; where this is obtained the resulting oxalate will be perfect. In no instance must the peroxide be red or black, or of a color that approaches black. If such is the case, it will be useless for preparing the ferric oxalate for platinum paper. Excellent platinum prints in black can be obtained from negatives that are somewhat thin, especially from films that have been developed with a metol-hydroquinone developer and lack density, by using the following contrast developer: Developer for Strong Contrasts in Platinum.—Potassium oxalate, 4 oz.; sodium phosphate, 1 oz.; hot water, 32 oz.; potassium bichromate, 22 gr.; glycerine, 2 oz.; potassium chloride, 1 oz. Stir the mixture well, use when cold. This developer must be kept in an amber-colored bottle, because it is affected by white light. Used in a subdued light, clearing (or fixing as it is sometimes termed) must be carried out as previously described. This developer will give a strong print from a weak negative.

**Raw Papers for Platinum Process.**—Rives and Steinbach (uncolored): "Schopf papier No. 27." Neusiedler A. G. Papier-fabrikation, Vienna: roll drawing papers of Schleicher and Schüll, Dürfen. Drawing papers of Whatman, Zander, and O. W. Paper Co.

**Sizing.**—Gelatin, 10 grams; swollen for 1 hour and dissolved in water, 500 to 1,000 c.c., by heat. Agar-agar, same formula as gelatin. Arrowroot. Rub in cold water, and pour mixture into enough boiling water to make a 1 or 2% solution.

**Standard Iron Solution (for making platinum paper).**—Dissolve iron ammo-

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### (Platinum Printing)

mium alum, 260 grams, in 1,000 c.c. of water; pour into strong ammonia, 100 c.c.; water, 1,000 c.c.; filter and drain precipitate, and gently warm with powdered oxalic acid (105 grams). Do not heat above 85 to 105° F. Dilute to 500 c.c.

**Cold-Bath Paper.**—(a) Dissolve lead acetate, 10 grams, in warm water, 100 c.c., and add oxalic acid, 4 grams, dissolved in a little water. White precipitate of lead oxalate falls. Filter, wash, and dry, and dissolve 1 gram in 100 c.c. of standard iron solution. (b) Potassium chloroplatinite, 1 gram; water, 6 c.c. (c) Swell gelatine, 2 grams, in water, 20 c.c.; add oxalic acid, ½ gram, and warm before use. Keeps a day or two. To make sensitizing liquids: (1) (a), 4.5 c.c.; (b), 3 c.c. Keeps a month in the dark. With Rives paper, arrowroot-sized, gives brownish black prints; on drawing papers, pure black; black on gelatine-sized Rives. (2) (a), 4.5 c.c.; (b), 3 c.c.; (c), 1 c.c. Blue-black on Rives sized with arrowroot. (3) (a), 3 c.c.; (b), 3 c.c.; sodium ferric oxalate (50% solution), 2 c.c. The quantities are for a 30 x 30 sheet. Add 2 to 3 c.c. of water to either for medium paper, and 3 to 8 c.c. for rough paper; more water still for gray pictures. Soft prints from normal negatives; for brilliance, add 10% solution of sodium chloroplatinite, 5 to 10 drops; or 1% solution of potassium bichromate, in same proportion. Developer: Potassium oxalate, 100 grams; potassium phosphate, 50 grams; water, 1,000 c.c.

**Preparation of Cold-Bath Paper (Lanier's Formula).**—Prepare the subjoined stock solutions: (a) Ammonium ferric oxalate, 1½ oz.; distilled water, 2 oz.; 10% solution of oxalic acid, 3¼ dr. (b) Chloroplatinite of potassium, 30 gr.; distilled water, 150 minims. For each sheet of paper 20 x 26 in., mix 136 minims of (b) with 68 minims of (a) and 136 minims of a 1 in 25 solution of bichromate of ammonium. This addition of the bichromate reduces the sensitiveness of the paper somewhat.

**Sensitizing Cold-Bath and Sepia Papers.**—Used in the preparation of "cold-bath" paper for black tones, and "hot-bath" paper for sepia tones. Prepare: (a) Chloroplatinite of potassium, 15 gr.; distilled water, 90 minims. (b) Ferric oxalate, 21 gr.; oxalic acid, 2 gr.; distilled water, 183 minims. For "cold-bath" paper, mix (a) and (b), and add 15 minims of water. For sepia paper, mix (a) and (b), and add 15 minims of a 5% solution of mercury chloride. The addi-

### (Platinum Printing)

tion of a few grains of potassium chlorate to any of the above gives increased contrast in the print. From 140 to 170 minims of solution are sufficient to coat a sheet of paper 20 x 36 in.

**Hot-Bath Paper.**—For brownish-black tones on arrowroot-sized paper, and pure black on drawing paper: Standard iron solution, 5 c.c.; platinum solution, B, 4 c.c. For matt paper, add 2 to 3 c.c. of water; for rough paper, 3 to 4 c.c. For blue-black prints on gelatine-sized paper: Standard iron solution, 6 c.c.; platinum solution, B, 4 c.c.; gelatine-oxalic solution, C, 1 c.c. For greater brilliance, add 5 to 10 drops of 10% sodium platinate solution, or of 1% potassium bichromate solution. Develop as for "cold-bath" paper, above; or potassium oxalate, 1 part; water, 3 to 5 parts. Temperature, 120 to 170° F.

**Print Out Platinum Paper.**—Sodium ferric oxalate (50% solution), 6 c.c. Platinum solution B (see above), 4 c.c.; add water, 2 to 3 c.c., according to paper. For brilliance, add 3 to 10 drops of sodium chloroplatinite solution (10%), or of 1% potassium bichromate.

**Sepia Paper for Hot Development.**—Size with arrowroot or agar-agar. Sensitize with standard iron solution, 6 c.c.; platinum solution, B, 4 c.c.; mercuric chloride (1 in 20) solution, 1.5 to 1 c.c.; sodium chloroplatinite, 2 drops 10% solution. For rough papers, add 2 to 4 c.c. of water. For brilliance, increase the chloroplatinite to 5 or 10 drops. Let coated paper hang until matt in appearance; then dry at 100° F. Develop at 160° F., with potassium oxalate, 100 grams; potassium phosphate, 50 grams; citric acid, 20 grams; potassium chloride, 10 grams; water, 1,000 c.c. Fixing or clearing bath: Hydrochloric acid, 5 to 10 c.c.; water, 1,000 c.c.

**Sepia Paper for Cold Development.**—(a) Dissolve yellow mercuric oxide, 1 gram, in 20 c.c. of water, by aid of 5 grams of citric acid. Warm, and filter. Size with agar-agar; sensitize with standard iron solution, 8 c.c.; platinum, B, solution, 4 c.c.; (a), as above, 1 to 4 c.c. sodium chloroplatinite (10%) solution, 2 drops; add 2 to 4 c.c. of water for rough papers. For brilliance, add 3 to 5 drops of chloroplatinite solution. Developers: Potassium oxalate, 100 to 300 grams; oxalic acid, 10 grams; water, 1,000 c.c. Or, Potassium phosphate, 30 grams; potassium oxalate, 70 to 300 grams; oxalic acid, 10 grams; water, 1,000 c.c. Fixing or clearing bath: Hydrochloric acid, 5 to 10 c.c.; water, 1,000 c.c.

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**Developer for "Black" Cold-Bath Paper.**—Potassium oxalate (neutral), 1 oz.; water, 4 to 10 oz. Potassium oxalate, 1 oz., dissolves in 3 oz. of water to form a saturated solution. A "1 in 4" (approximate) solution may be conveniently prepared thus: In 30 oz. of water dissolve 13 oz. of potassium carbonate, then add 9 oz. of powdered oxalic acid, and boil the solution. Test with litmus. If acid, add more carbonate; if alkaline, more acid, until the solution is neutral. For more brilliant prints, normal formula plus 2 to 5 parts per 100 of 1% potassium bichromate solution. Print slightly deeper.

**Developer for Kodak Paper.**—Potassium oxalate, 2 oz.; water, 10 oz.; or, for bluer tone, potassium oxalate, 1 oz.; potassium phosphate,  $\frac{1}{2}$  oz.; warm water, 10 oz. Use either at 60 to 65° F.

**Clearing Baths.**—Hydrochloric acid, 1 part; water, 60 parts.

**Temperature of Developing Solutions.**—For cold-bath papers, from 60 to 100° F., preferably 60 to 70° F. For hot-bath, from 120 to 180° F., usually 130 to 150° F. Higher temperature, warmer color, quicker action.

**Warm Tones (hot-bath paper).**—Potassium oxalate, 2 oz.; potassium phosphate,  $\frac{1}{2}$  oz.; citric acid, 180 gr.; potassium chloride, 90 gr.; water, 20 oz.; add at time of use, 1 dr. of mercuric chloride solution (20 gr. per oz.). Temperature not below 175° F. Acid fixing bath: Hydrochloric acid, 1 in 200.

**Warm Sepia Tones.**—(a) Potassium oxalate, 2 oz.; water, 14 oz. (b) Potassium citrate, 150 gr.; citric acid, 240 gr.; mercuric chloride, 90 gr.; water, 14 oz. For use, take equal proportions—say 1 oz. each for half-plate print—and slightly warm. Develop, and, without washing, put through 2 or 3 hydrochloric acid baths, not stronger than 1 in 200. More of (b) than of (a) gives warmer color. A thin yellowish negative is best.

**Warm Brown, on Cold-Bath Platinotype.**—Potassium oxalate, 4 oz.; water, 40 oz. Leave in open bottle for a few weeks, filtering before using.

**Warm Blacks, on Black-Tone Papers.**—Potassium oxalate, 1 oz.; zinc oxalate, 200 to 250 gr.; water, 4 oz. Heat to 70 or 80° F., and immerse prints. More zinc oxalate gives warmer tones.

**Sepia Tones on Black-Tone Papers.**—Potassium oxalate, 1 oz.; ammonium monophosphate, 125 gr.; copper sulphate, 5 gr.; water, 5 oz.

**Developer for Sepia Tones.**—(a) Po-

### (Platinum Printing)

tassium oxalate, 4 oz.; water, 16 oz. (b) Copper chloride, 125 gr.; water, 8 oz. (c) Mercuric chloride, 1 oz.; water, 16 oz. (d) Lead acetate, 32 gr.; water, 4 oz. Distilled water for all. Mix (a), 12 parts, with (b), 4 parts; add 4 parts of (c) and 1 part of (d), and heat till the precipitate first formed is redissolved. Use at 175° F., developing as usual, pass through usual acid baths, then into ammonia (4 minims per oz.) for 5 minutes, and wash.

**Damp Paper.**—1.—Almost print out, and develop on usual oxalate solution, 8 parts; potassium chlorate (1% solution), 1 part.

2.—If slightly damp, print slightly more deeply than usual, and add potassium bromide to the developer, in about the proportion of 30 minims of a 10% solution to each oz. of normal developer.

3.—If very damp, print out to almost full length, and develop with weak developer, 9 parts; potassium chlorate (10% solution), 1 part.

4.—If very damp, print out almost completely, and develop with normal developer, plus 10 to 15 drops of sodium hypochloride solution per oz.

5.—If very damp, print about as usual, develop with strong potassium oxalate, 1 oz.; oxalic acid, 1 oz.; potassium chloride, 24 gr.; water, 2 oz.; at a temperature of 90° F.

**Catechu Toning (mellow brown tones).**—Stock solution: Catechu or cutch, 120 gr.; water, 5 oz. Boil 5 minutes in glass flask, cool, and add alcohol, 1 oz. Toning bath: Stock solution, 25 minims; water, 20 oz. Used cold, toning takes several hours; heated (130 to 150° F.), about 15 minutes. Sugar, etc., in developer favors the toning process. Formula: Potassium oxalate, 7 oz.; genuine West Indian (cane) sugar, 159 gr.; water, 14 oz. Boil for 5 minutes, and develop cold-bath paper at 100 to 120° F. If high lights stain, soak in Castile soap, 4 gr.; soda carbonate, 8 gr.; water, 1 oz.

**Reddish-Brown Tones with Uranium.**—Uranium nitrate (10% solution), 60 minims; potassium ferricyanide (10% solution), 60 minims; soda sulphite (10% solution), 60 minims; glacial acetic acid, 3 dr.; water to 6 oz. Intensifies also.

**Platinotypes, To Intensify with Platinum.**—(a) Sodium formate, 48 gr.; water, 1 oz. (b) Platinum perchloride, 10 gr.; water, 1 oz. (c) For use, take 15 minims each of (a) and (b) to 2 oz. of water. When sufficiently intensified (about 15 minutes), wash and dry.

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### (Platinum Printing)

**Intensification with Silver.**—Hydroquinone, 2 gr.; citric acid, 20 gr.; distilled water, 1 oz. Place the print in this until thoroughly soaked. Pour off, and add to the solution silver nitrate (10% solution), 10 drops. Pour back on the print, which will intensify rapidly. Then wash. The solution becomes turbid during intensification.

**Gold Toning (Slight Intensification).**—For blue-black tones and for converting rusty black into pure black, soak print in warm water, lay on warm glass, brush over glycerine, and blot off. Pour on a few minims of solution of gold chloride (1 gr. per dr.), and rapidly brush in all directions. When toned, rinse, and sponge back and front with metol, 50 gr.; soda sulphite, 1 oz.; potassium carbonate,  $\frac{1}{2}$  oz.; water, 20 oz. Tone in daylight. Not for sepia or very old prints; a few months seems about the limit.

**Mercurio-Uranotype.**—(a) Saturated solution of uranium chloride. (b) Saturated solution of mercuric chloride. Sensitize in (a), 1 oz.; (b), 1 dr. Print to full strength; tone on a dilute solution of chloride of gold or chloroplatinite of potash. Wash in water acidified with hydrochloric acid. Wash. Or, the print may be merely washed in acidified water and then thoroughly washed and dried.

**Platino-Uranotype.**—(a) Saturated solution of uranium chloride. (b) Chloroplatinite of potash, 60 gr.; distilled water,  $1\frac{1}{2}$  oz. Take equal parts of (a) and (b), and spread over a well-sized piece of paper. Potassium chlorate may be added to increase contrast. Expose under a negative until the faintest trace of an image is visible; then develop on cold solution: Saturated solution of neutral oxalate of potash in cold distilled water, and dissolve dry ferrous oxalate in this to saturation. Wash in water acidified with hydrochloric acid, about 1½%, till the drainings are colorless. Wash thoroughly, and dry.

**Palladiotype.**—Coating the paper with either uranic chloride, ferric oxalate, or sodic ferric oxalate, or a mixture of any or all of these. Developer:  $\frac{1}{2}$  dr. of a 15-gr. solution of sodio-chloride of palladium is diluted with about 1 oz. of water, and the print floated thereon face downward. It is better to add a trace of hydrochloric acid to the developer. Fix as in platintype. The result will be a print like a platinum print, only of a nice warm tone, which may be rendered colder by adding a trace of platinum to the developer.

### (Carbon Printing)

#### Carbon Printing.

**Making Tissue.**—Stock jelly: A warm mixture of gelatine, 2 parts; water, 4 to 7 parts; sugar,  $\frac{3}{4}$  to  $1\frac{1}{4}$  parts; mixed in various proportions with ground jelly colors—i.e., pigments ground fine, and kept moist with thinned stock jelly. Coating mixture consists of stock jelly plus (2½ to 25%) jelly color.

**To Coat by Hand.** Strain warm mixture into flat dish standing in warm water, and clear bubbles off the surface with a strip of paper. Hold paper to be coated upright at the further end of dish, its lower edge just touching the liquid, and gently lower it on to the surface. Raise with a steady motion, allow to drip, and hang up to dry.

**Sensitizing.** For thin, weak negatives, potassium bichromate, 10 gr. per oz. of water. For medium negatives, 20 gr. per oz. For harsh negatives, 30 gr. per oz. Rather stronger in cold weather. Temperature, 60° F. Immerse 3 minutes. Dry in not less than 8 or 10 hours, at a temperature not higher than 120° F. Or, with potassium ammonium chromate: For soft negatives, 12 gr. per oz.; for very hard negatives, 32 gr. per oz. Tissue keeps better than with bichromate. Weak bath gives slow tissue, which keeps well, and prints with vigor. Strong bath gives rapid tissue, with lesser keeping powers, and giving soft pictures.

**Quick-Drying Sensitizer.**—Evening sensitized tissue will dry by next morning, without special drying arrangements, if the bichromate is dissolved in half the usual quantity of hot water, and the other half made up with alcohol when the solution has cooled a little.

**Bennett Sensitizer.**—Potassium bichromate, 4 dr.; citric acid, 1 dr.; ammonia (.880), 3 dr.; water, 25 floz. Said to be unaffected by gas in the drying room.

**Carbon Tissue.**—Nelson's No. 1 gelatine,  $\frac{1}{4}$  oz.; Nelson's amber gelatine, 2 oz.; white sugar,  $\frac{1}{4}$  to  $\frac{1}{2}$  oz.; white soap,  $\frac{1}{4}$  oz.; water to make 10 oz. Swell the gelatine in a few ounces of water, heat in jacketed pan until dissolved, then add the sugar and soap, stirring occasionally until dissolved. Add, according to color required—Engraving black: Lampblack, 160 gr.; carmine lake, 16 gr.; indigo, 10 gr. Warm black: Lampblack, 24 gr.; carmine lake, 24 gr.; burnt amber, 15 gr.; indigo, 10 gr. Sepia: Lampblack, 15 gr.; sepia, 150 gr. Red-brown: Indian red, 40 gr.; Indian ink, 30 gr.; carmine lake, 24 gr. Colors must be fine, and well mixed.

## Photography

### (Carbon Printing)

**Flexible Temporary Support.**—Coat fine paper with gelatine solution, of strength according to surface. For matt, 5%; for medium, 7½%; for high glaze, 10%. Then float on lac (1 lb.) in borax (4 oz.), soda carbonate (1 oz.), and water (200 oz.). Each sheet is rubbed with a solution of rosin in turpentine containing a few grains of wax.

**Alum Bath (for discharging Bichromate Stain).**—Alum, 1 oz.; water, 15 oz.

**Single Transfer Paper.**—Brush over plain paper, 1 oz. of gelatine soaked in 20 oz. of water for several hours, and dissolved on water bath; add to the almost boiling solution, chrome alum, 20 gr., in 1 oz. of warm water, drop by drop, stirring briskly.

**Collodion for Double Transfer from Opal.**—Enamel collodion, 1 oz.; ether, 1 oz.; alcohol, 1 oz. Flow over opal, allow to just set, wash in water, and squeeze the soaked tissue to it. Enamel collodion, Sec. 19.

**Waxing Solution for Temporary Support.**—(a) Pure beeswax, 30 gr.; benzol, 10 oz. (b) Yellow rosin, 100 gr.; turpentine, 10 oz. Mix, apply with fine flannel; polish off with second flannel.

**Opal and Ivory as Final Support.**—Swallow 1½ oz. of gelatine in 20 oz. of water, melt by heat, and add chrome alum (2 oz. of 30 gr. per oz. solution). Filter through muslin. Soak print and final support in warm liquid, and squeeze.

**Artists' Canvas as Final Support.**—Remove paint by scrubbing with hot soda solution until little remains on canvas beyond the priming. Dry, and give several coats of cooking gelatine, 4 oz.; sugar, 2 oz.; glycerine, 2 oz.; water, 30 oz.; chrome alum (30 gr. per oz.), 1 lb. oz. Dry after each coat, and rub with fine sandpaper if uneven. Place print in warm solution as for opal, brushing this into canvas. Then pour solution freely over canvas, lower print at once on it, and squeeze together. Dry, strip off temporary support, and clean the surface of print with benzol.

**Linon or Calico as Final Support.**—Prepare as above, using same mixture, but with 8 oz. of barium sulphate added.

**Wood Panels as Final Support.**—Remove paint by treating with soda, dry, rub with fine sandpaper to give tooth, and coat with cooking gelatine, 3 oz.; sugar, 1 oz.; glycerine, ½ oz.; water, 30 oz.; chrome alum solution (30 gr. per oz.), ¾ oz.

**Substratum for Transparencies.**—Gelatine, fine, hard, ¾ oz.; water, 40 oz.;

### (Ozotype, Ozobrome)

potassium bichromate, 60 gr. Coat glass plates, dry, and expose to light.

**Lambertype (Carbon with Brilliant Surface).**—Plate glass is thoroughly cleaned, dried, rubbed and polished with pure beeswax, 5 gr.; benzol, 1 oz. Set aside for the benzol to evaporate. Coat with pyroxyline (or celloidin), 100 gr.; ether, 10 oz.; alcohol, 6 oz.; castor oil, 10 drops. Allow to set. Wash in a gently flowing stream of cold water until all greasy appearance is lost. The printed tissue is now soaked, squeezed, stripped, and developed in the usual way. After washing, the final support is brought in contact, under water, with the print. The two are allowed to dry spontaneously, and when quite dry the collodion-supported image is detached from the glass, yielding a print with a very glossy surface and transparent shadows.

**To Intensify Carbon Prints.**—Potassium permanganate, 20 gr.; water, 1 oz.; dip prints, wash well, and dry. Repeat, if necessary. Or, Pyrogallie acid, 4 gr.; citric acid, ¼ gr.; water, 1 oz.; add a drop or two of silver nitrate solution (40 gr. per oz.) at time of use.

**Reliefs, Photographic.**—Hard gelatine, 200 grams; gum arabic, 100 grams; water, 1,000 c.c.; glacial acetic acid, 10 c.c. Soak the gelatine and the gum in the water for some hours, occasionally stirring; add the acid, and heat in a water bath till melted. This will keep, but before use it must be heated, and poured on to a leveled sheet of glass to the depth of about ¼ in. When set, it can be dried, or sensitized at once with potassium bichromate, 128 grams; liquid ammonia (.880), 21 c.c.; water, 1,000 c.c. Dry, expose under the negative until strongly printed out, then soak for some hours in alum, 20 grams; glacial acetic acid, 20 c.c.; water, 1,000 c.c.; or until all the yellow color has disappeared. The high relief thus obtained should be oiled, and a cast taken in plaster of paris. When this has set hard it can be stripped.

### Ozotype, Ozobrome, Carbohydr, and Kindred Processes.

**The Ozotype Process (English patent 10,026, of 1898).**—A piece of paper, lightly sized with hardened gelatine, is coated with a patented sensitizing solution, consisting of bichromate with a manganese salt, by means of a brush or soft pad. When dry, the sensitive paper is exposed under a negative until an image is formed, somewhat darker than that in the platinotype process, and the print is washed in

## Photography

### (Ozotype)

cold water for from 10 to 20 minutes to remove the free bichromate. A piece of pigment plaster (carbon tissue) is immersed until limp, in the acid or reducing bath:

**Concentrated Acid Bath.**—Solution of sulphate of copper, 20%; 100 parts; glacial acetic acid, 6 parts; glycerine, 5 parts; hydroquinone, 5 parts. For use, concentrated acid solution, as above, 4 dr.; water, 20 oz. Stronger solutions produce flatter pictures, weaker solutions give greater depth and contrast.

**Squeegeeing.**—When the plaster is quite limp, the washed initial print is brought into contact with it in the dish, and the two papers at once withdrawn from the bath, squeegeed together with a flat squeegee, and placed under slight pressure for half an hour.

**Developing.**—At the expiration of this time the adhering papers are placed in hot water (about 110° F.), the plaster backing is stripped off, and the print developed like an ordinary carbon print.

**Alum Bath.**—May be used for hardening finished prints: Powdered alum, 1 oz.; hydrochloric acid, 30 minims; water, 20 oz. Soak 5 minutes. Rinse in cold water. Dry.

**Ozobrome.** Ozobrome is a method of making several carbon pictures from one bromide print or enlargement without the action of light. The materials required are: Bromide prints hardened with formaline or alum, pigment plaster (a special carbon tissue), ozobrome pigmenting solution, acid solution, and, for the transfer method, a piece of ozobrome transfer paper. One bromide print or enlargement may be used to produce many ozobromes by the transfer process.

**A. Non transfer Ozobrome.**—Hardening bath: Formaline, 5 parts; water, 100 parts. Or, Chrome alum, 4 parts; water, 100 parts. Soak 10 minutes. Wash 15 minutes in cold water. Dry.

**Working Pigmenting Bath.**—Ozobrome pigmenting solution, 1 part; water, 4 parts.

**Working Acid Solution.**—Hydrochloric acid (10% solution), 1 oz.; water, 25 oz. Arrange four dishes side by side, A, B, C, D. Let dish A contain the pigmenting solution, B the acid solution, and half fill C and D with cold water.

**Operations.**—Place bromide print, face upward, in D, sponge the surface to remove air bells. Leave in this bath until the other operations are completed. Immerse the pigment plaster, face upward, in A, keeping it under the solution (a camel's-hair mop brush is particularly

### (Ozobrome)

suitable for the purpose). Leave in this bath until saturated (2 to 2½ minutes in winter, and a somewhat shorter time in summer). When the plaster is saturated take out of the dish, drain for a few seconds, then place in B for a few seconds—for a normal bromide print, 10 to 15 seconds; for a weak or gray print, 5 to 10 seconds; for a print which has strong shadows and harsh contrasts, 20 seconds. After removal from the bath hold it up by a corner for about 30 seconds. Remove the bromide print from D, and place it, face upward, in C. Float the plaster, face downward, on the top of the water, bring the underlying print into contact with it under the water, and withdraw the papers clinging together, adjusting them so that a margin of plaster is shown around the print. Place the adhering papers upon a sheet of plate glass, or any hard, smooth surface, plaster uppermost; squeegee them into contact, with a flat squeegee, at first very gently, and never pressing roughly. Take care that the papers do not slip, or a double image will result. Make a note of the time on a corner of the plaster backing with a soft Conté pencil; then, lifting the underlying paper with the blade of a knife, place the adhering papers upon a sheet of glass, where they should be left for 15 to 20 minutes. At the end of this time the adhering papers are placed into warm water, 105 to 110° F., the plaster backing stripped off, and the picture developed by laying with hot water, as in the ordinary carbon process. The bleached silver image which is now beneath the gelatine picture may be removed, after drying by a hypo bath to which a little potassium ferricyanide may be added if any of the original silver remains unbleached. Wash for a few minutes in cold water.

**B. The Transfer Ozobrome Process.**—With hardly any more trouble, the ozobrome picture may be transferred to a piece of ozobrome transfer paper, and is then different in no way from a carbon produced by the ordinary carbon process, while the original bromide may be used for other prints.

**Procedure.**—Immerse a piece of ozobrome transfer paper in cold or lukewarm water, and sponge well, both back and front, to remove air bells. Place the bromide print, with the pigment plaster adhering, in cold water, and separate them by gently pulling them apart. Remove air bells from the edges of the plaster with the finger, and bring into contact with the piece of soaked transfer paper in the dish of water. Squeegee into con-



## Photography

### (Carbograph)

tact, with a flat squeegee, and place under slight pressure between blotting paper for 15 to 20 minutes. Place in hot water, 105 to 110° F. Strip off the carbon backing and develop the picture as usual, with hot water.

**Recovering the Used Bromide Print.**—Wash, to remove the pigmenting solution; redevelop in daylight, with any ordinary developer. Wash, and dry. It may be used to make more ozobrome.

**Control in Ozobrome.**—The absorption of a normal quantity of acid by the plaster will give a correct rendering of the bromide print, and any variation in quantity of acid will effect a change in the gradation. To obtain a picture corresponding to the bromide print, immerse plaster in acid bath 10 to 15 seconds. A longer immersion will lower the relief of the resulting picture, giving delicacy and detail, while a shorter immersion will raise the relief, producing strong pictures from weak prints. The following acid bath gives brilliant results from over-exposed and veiled bromide prints, but should not be used for harsh or plucky bromides, or where delicate skies are required: Water, 25 oz.; citric acid, 90 gr.; chrome alum, 180 gr. Immerse in this bath not less than 15 seconds. In the non-transfer method the bleached image beneath the carbon picture may be re-developed partially or entirely, and this may be made use of in various ways. For instance, a weak picture may be rendered stronger by reblackening the image underneath. If a weak bromide developer be applied with a brush, local intensification may be effected, and a sky which is hardly strong enough for the rest of the picture may be made heavier in this way; the remainder of the image may be removed by a 10% hypo bath. The underlying image may be also toned by the various bromide toning solutions. The developing or toning solutions must be removed by washing, for about 15 minutes.

**Carbograph.**—Outline of the Process.—A sensitive gelatin bromide emulsion paper, pigmented as carbon tissue; exposed as for a bromide; developed in the usual way, cleared, then bichromatized, and developed with hot water, as in carbon work.

**Exposure.** Test pieces of Rotograph bromide paper are supplied. The correct exposure for these, with the negative in hand, is found, then multiplied for Carbograph tissue: Warm sepia, 5 times; light green, 7 times; cold sepia, 8 times;

### (Ink Process)

engraving black, 9 times; photo brown and red chalk, 10 times.

**Developer.**—Iron citrate, supplied by the manufacturers. Or, (a) Potassium oxalate, 6½ oz.; hot distilled water to make 20 oz.; (b) Ferrous sulphate, 1½ oz.; citric acid, 48 gr.; distilled water to 5 oz. Immediately before use add 1 part of (b) to 5 parts of (a), and add to the mixture 5 drops of a 10% solution of potassium bromide—i.e., 24 minims per fl. oz.

**Clearing Bath.**—After development for 5 to 7 minutes, at 50 to 60° F., without washing, immerse for 1 minute in acetic acid (glacial), 96 minims; water, 20 oz.

**Bichromatizing.**—Potassium bichromate, 384 gr.; water, 20 oz.; potash alum, 10% solution, 192 minims. Sensitize for 3 minutes.

**Developing.**—Begin at 100 to 105° F., increasing very gradually, if necessary.

**Fixing.**—Hypo, 4 oz.; water, 20 oz.; 10 to 15 minutes.

**Hardening.**—Alum, 1% solution.

**Removing Silver Image.**—(a) Hypo, 2 oz.; water, 20 oz. (b) Potassium ferricyanide, 2 oz.; water, 20 oz. Add 1 part of (b) to 2 parts of (a) for use.

**A Green Print Process.**—Float ordinary paper on a 2% solution of gelatine, made by dissolving 10 gr. of gelatine in 1 oz. of water; then dry. Sensitize with water, 100 parts; potassium bichromate, 3 parts; manganese sulphate, 5 parts. Apply with a brush, and dry in the dark. Paint rather deeply, wash for 2 or 3 minutes, until the whites appear quite pure. Surface dry with blotting paper, and lay film up on a sheet of glass, and apply pyrocatechin, 1 part; water, 10 parts; sparingly, with a brush. When fully developed, wash for 5 minutes, and dry quickly. Brilliance somewhat lost in drying; regained to a great extent by varnishing.

**An Ink Process.**—Bichromate of potash, 1 part; distilled water, 20 parts. Dissolve, and render neutral with ammonia. To every 3 parts of this add powdered gum arabic, 1 part. Transfer to a bottle, and shake frequently until dissolved. Filter, and spread evenly on albuminized paper with a Blanchard brush, and hang to dry. Expose behind a negative. Lay the print, face downward, on water, and allow to soak for some time, with repeated changing of the water. Soak in alum solution, and again wash. Float for 2 minutes on pyrogallol, 1 part; water, distilled, 50 to 80 parts. Wash, and float on sulphate of iron, 10 parts; distilled water, 100 parts; and again wash.

## Photography

### (Oil Pigment Process)

If not dark enough, the process may be repeated.

**Bromoil, etc.**—A method of producing a pigment print upon a bromide. A modification of ozobrome.

**The Original Print.**—A good bromide from a vigorous, strong negative, on thick, smooth paper, developed in amidol or metol hydroquinone, fixed in acid-alum hypo, washed, and dried as usual.

**Bleaching.**—Soak in water until limp. Bleach in special bromoil solution, 1 part; water, 3 parts.

**Acid Bath.**—Sulphuric acid, 1 part; water, 20 parts; 2 to 5 minutes. Wash.

**Fixing.**—Hypo, 4 parts; sodium sulphite, 1 part; water, 40 parts. Wash for 3 minutes.

**Pigmenting.**—With oil pigment (printing ink), applied by brush, dabber or roller.

**Bromoil Varnishing Method**, whereby prints take the varnish in the shadows, while the high lights and pale tones remain matt. Bleach for about 2 minutes in solution given above. Wash. Redevelop with any ordinary developer (preferably, amidol, 2 gr.; sodium sulphite, 20 gr.; water, 1 oz.). Or, Sulphide in sodium sulphide (10% solution), 25 minims; water, 2 oz.; hydrochloric acid (20% solution), 5 minims. The acid to be added just before use, and the whole employed only while quite fresh. Acid bath (as above: Ozobrome). Varnishing: Lay print, face upward, on a pad of wet paper. Varnish with Japan gold size, 5 parts; raw linseed oil, 1 part, mixed with knife or muller on a palette or piece of glass. Apply with a camel's-hair dabber, as used by china painters. If varnish adheres where not wanted, wash print with soap and water; or mop over with a soft rag moistened in paraffine, then wash with soap and water.

**Pigment for Bromoil.**—Any pigment that is exceedingly fine, lampblack. Home-made pigment by catching the smoke from a lamp burning turpentine, upon any suitable chilling surface—*e.g.*, an enameled iron developing dish. Mix with as small a quantity of Japan gold size as possible, to a very stiff paste, and keep in a tight-lidded tin box or a wide-mouthed bottle. For use, thin down on palette with as small a quantity as possible of raw linseed oil, 1 part; common benzoline, 2 parts.

**The Oil Pigment Process.**—Gelatined paper or sized paper is sensitized on potassium bichromate, printed in daylight under a negative, washed out in water, and pigmented by rolling or dabbing with

### (Miscellaneous Processes)

an oil paint, or greasy printing ink, or, preferably, with specially prepared oil pigment.

Sensitize in potassium bichromate, 1 oz.; water, 20 oz.; for 1 minute. Drain; dry in dark. If water is hard, sensitize by brushing with a hard, flat brush; otherwise, by floating.

Spirit sensitizer may be used with advantage, and is conveniently applied with a Blanchard brush. Or, A. Ammonium bichromate, 100 gr.; sodium carbonate, 10 gr.; water, 4 oz. B = A, 1 part; alcohol, 2 parts; mixed shortly before use.

Print for about one-eighth the time necessary for printing out paper.

Wash in cold water, 20 to 30 minutes, until all bichromate stain is removed.

**Pigmenting.**—Lay the print, face upward, on a pad of damp blotting paper. Remove surface moisture by dabbing with damp, smooth rag. Spread a little pigment on a piece of glass, covered by a plate box to prevent evaporation of solvent. Charge the brush lightly with pigment, dab it on clean glass until evenly charged, then apply to print by dabbing. Apply very little pigment at first, strengthening gradually.

**Prints from Flat Negatives.**—Swell the gelatine in water at 100° F., for 1 minute, gradually cooling to 65° F.; then pigment.

### Miscellaneous Photographic Papers and Processes.

**Lead Printing Paper.**—To prepare a lead printing, proceed as follows: Lay some coarse drawing paper (such as contains starch) on an 8% potassium iodide solution. After a moment take it out and dry. Next, in the dark room, lay the paper, face downward, on an 8% lead nitrate solution. This sensitizes the paper. Again let dry. The paper is now ready for printing. This process should be carried on till all the detail is out in a grayish color. Then develop in a 10% ammonium chloride solution. The tones obtained are of a fine blue black.

**Oxalate Silver Printing Papers.**—M. Van Loo, a Belgian photographer, gives a method of preparing a photographic paper somewhat resembling platinumotype, but much less expensive. The paper is coated with the following solution: Water, 100 parts; ferric oxalate, 15 parts; oxalic acid, 3 parts; nitrate of silver, 3 parts. The above proportions should be adhered to as nearly as possible to secure good results. The printing is carried out in the same manner as with platinum paper; that is, until the image is well dis-

## Photography

### (Citrate Paper)

tinguished. After printing, the paper is placed in a developing bath made up as follows: Water, 100 parts; borax, 60 parts; tartrate soda, 60 parts. Dissolve and add several drops of a 5% solution of potassium bichromate; a greater proportion of bichromate gives an image hard and full of contrast; by using less, the image becomes gray and feeble. A certain latitude is thus given, which is of advantage for negatives of different intensities. After the development, which lasts 5 or 6 minutes, the prints are washed for a few moments in running water, and the toning is carried out with the following bath: Water, 100 parts; potassium chloroplatinate, 1 part; common salt, 10 parts; citric acid, 10 parts. The prints are left in the bath until the desired intensity is obtained, and are then fixed in a 2% solution of ammonia; the fixing lasts about 10 minutes. They are then washed thoroughly, as usual.

**Sensitizing of Photographic Drawing Paper.**—Photographic prints of extensive landscapes and portraits, on a large scale, are successfully and artistically made by the use of Whatman's paper, which is sensitized as follows: The whole sheet is first plunged into a bath consisting of 13 parts, by weight, of pure sodium chloride, 9 parts of ammonium chloride, 0.50 part of potassium bichromate, and 1,000 parts, by weight, of water. After drying, it is sensitized by holding one side of it for 2 minutes over a bath of 32 parts of silver azotate, 10 parts of citric acid and 1,000 parts, by weight, of water. A strong impression is to be taken in the printing frame. The toning and fixing processes are the same as with other photographic paper.

**Citrate Paper.**—A Gelatino-Citrate of Silver Emulsion for Photographic Paper. —At a recent session of the Union Nationale des Sociétés Photographiques de France, M. A. Blanc brings out the fact that the formulas for preparing the photographic papers of the citrate of silver type are little known, and he proposes to give a formula which he has found very good in practice, giving very clear whites with a great facility in toning. Before proceeding to prepare the emulsion proper a preservative emulsion is first prepared according to the formula: Alcohol, 90%, 15 c.c., 4 dr.; white shellac, 5 gr., 1¼ dr. Dissolve hot, and pour rapidly into 100 c.c. or 3 oz. of boiling water; filter through absorbent cotton. The yellowish white emulsion thus formed will keep for a considerable time. To prepare the sensitive emulsion he proceeds as follows.

### (Postal Cards)

**Solution A:** Gelatine, best quality, 9 grams, 2 dr., 15 gr.; chloride of cobalt, 5% solution, 6 c.c., 1½ dr.; neutral tartrate of ammonia, 2 grams, 30 gr.; citrate of ammonia, ½ gram, 30 gr.; water, 70 c.c., 2 oz., 1½ dr. This is to be placed in a porcelain receptacle of about 150 c.c., or 5 oz. capacity; in a smaller vessel is placed solution B: Nitric acid, 2.3 grams, 33 gr.; distilled water, 20 c.c., 5 dr. After mixing, add 2½ grams or 38 gr. of crystallized nitrate of silver. The vessels A and B are placed in a water bath, and the temperature kept between 70 and 80° C. Each solution having been well mixed, B is poured rapidly into A, and to the emulsion which forms is added: Alcohol, 90%, 10 c.c., 2½ dr.; preservative emulsion, 5 c.c., 1¼ dr. Mix, and filter through absorbent cotton; the emulsion is then ready to be applied to the paper. It should be used as soon as possible after preparation, as it will not keep longer than a few days. The paper, of course, may be kept for a long time without deterioration.

**Photographical Postal Card.**—The *Papier Zeitung* gives the following method of preparing paper for photographic purposes, which is so simple that it may be applied to postal cards. Any well "sized" paper is available for the purpose, however, and even an unsized paper may be employed, provided it be treated with a 10% solution of gelatine in water carrying 2% of arrowroot - i.e., made soluble by boiling. A 50% decoction of carrageen is also available for the purpose. This, which is really a sizing, may be applied to the surface of the paper with a broad, flat pencil. A surface thus prepared is far better, and the pictures thereon are stronger than when an unsized paper is employed. Having prepared your paper, go over the surface (after letting it dry thoroughly), using a similar pencil, with a solution of 10 parts of iron oxalate in 100 parts of distilled water, and let dry. With a clean pencil, kept especially for the purpose, again go over the surface with a 1% solution of silver nitrate in distilled water, and let dry. Red light must be used in these two operations. The paper is now ready for use, and under proper precautions, chief of which is the absolute exclusion of light, will keep for several days. In printing, make a strong copy, and develop in the following bath: Distilled water, 400 parts; potassium oxalate, neutral, 80 parts. Mix. After development wash thoroughly, and fix in the following bath: Distilled water, 100 parts; sodium

## Photography

### (Printing on Sateen)

thiosulphate, 5 parts; gold chloride solution, 1%, 5 parts. Mix. This is the bath recommended, but other baths may be used.

**Photographic Post Cards by the Uranium Process.**—A variety of tones may be obtained in photographic post cards sensitized with a solution of uranium, and immersed in solutions of various chemicals after exposure. Two formulas given in the *Photo-American* for the uranium solution are:

1.—Uranium nitrate, 160 grams; dextrine, 40 grams; distilled water, enough to make 1,000 c.c.

2.—Uranium nitrate, 160 grams; dextrine, 40 grams; copper sulphate, 40 grams; distilled water, 1,000 c.c.

Brush over the card with the solution, and dry. Reddish tones are obtained by immersing the exposed prints in potassium ferricyanide, 40 grams; distilled water, enough to make 1,000 c.c. Wash, and dry. Green tones are obtained by immersing in a 2% solution of cobalt nitrate; greyish-black tones, by treating the prints with a 5% solution of silver nitrate after washing; violet tones, by washing the prints and immersing in a 5% solution of gold chloride.

**Preparing Sateen of Various Colors for Photographic Printings.**—Make up the following mixture, under a light not stronger than 16 candle power: (a) Hot distilled water, 1 oz.; citric acid, crystals, 1 oz. (b) Distilled water, 8 oz.; ammonio citrate of iron, 1 oz. (c) Hot distilled water, 4 oz.; nitrate of silver, 1 oz. Shake the contents of each bottle well until the salts are completely dissolved; add (a) to (b), then add (c). Filter the mixture through absorbent cotton, in a clean glass funnel, into an amber-colored, wide-mouthed bottle. The sensitizer is now ready for use. Sensitize the sateen by laying it back down upon a sheet of glass, apply the solution with a rubber-bound camel's-hair brush upon the face of the sateen, suspend to dry in a warm closet away from actinic light. When dry place it upon a negative, expose to sunlight, print only just as deep as the finished picture should be, remove from the printing frame, wash several times in clean water, pass the print through any good gold toning bath of half the usual strength for 15 sec. only, wash again, then place into a solution of hyposulphite of soda, 2 oz. to 20 of water. About 5 min. will fix the print. Wash well for a quarter of an hour in running water, wring the print well during washing, then place it face down upon a carefully waxed and polished ferro-

### (Ceramic Photography)

type plate, spread it flat with a squeegee. When dry the print can be easily removed, cut to shape, and finished according to taste.

**Photographing on Silk.**—The silk (China silk is said to be the best) is thoroughly and carefully washed, to free it from dressing, and then immersed in the following solution: Sodium chloride, 4 parts; arrowroot, 4 parts; acetic acid, 15 parts; distilled water, 100 parts. Dissolve the arrowroot in the water by warming it gently, then add remaining ingredients. Dissolve 4 parts of tannin in 100 parts of distilled water and mix the solutions. Let the silk remain in the bath for 3 minutes, then hang it carefully on a cord stretched across the room to dry. The sensitizing mixture is as follows: Silver nitrate, 90 parts; distilled water, 750 parts; nitric acid, 1 part. Dissolve. On the surface of this solution the silk is to be floated for 1 min., then hung up till superficially dry, then pinned out carefully on a flat board until completely dry. This must, of course, be done in the dark room. Print, wash and tone in the usual manner. A writer in the *Chemist and Druggist* some time ago recommended a mixture of the acetate and sulphocyanide toners as giving the best results.

### CERAMIC ENAMELS AND WATCH DIAL PHOTOGRAPHY

**Organizer and Sensitizer.**—1.—Organizer: Dextrine, 3 dr.; honey, 4 dr.; albumen, 6 dr.; glucose, 1 oz.; water to 10 oz. 2.—Sensitizer: A cold saturated solution of potassium bichromate in water (about 1 oz. to 10 oz.). Or, 1.—Organizer: Fish glue (Le Page's), 1 oz.; glucose, 4 oz.; glycerine, 10 drops; water, 10 oz. 2.—Sensitizer: Ammonium bichromate, 1 oz.; water to 10 oz. Or, Dextrine, 60 gr.; white sugar, 75 gr.; ammonium bichromate, 30 gr.; glycerine, 2 to 8 minims; distilled water, 3 oz.—*Obenetter*. Or, Gum arabic, 60 gr.; glucose, 45 gr.; glycerine, 10 minims; potassium bichromate, 30 gr.; distilled water, 2 oz.

**Borax Transfer Solution.**—Saturated solution (boiled) of fused borax, 3 parts; water, 1 part.

**Transfer Solution** (to be used when image is transferred with proper size down to plaque).—Water, 80 oz.; sugar candy, 16 oz.

**Transferring.** Certain difficulties in "firing" arise from an imperfect transfer. For the transfer collodion use: Enamel collodion, 1 part; ether, 1 part. If too thick, "fizzle" in the firing, unless the

## Photography

### (Ceramic Photography)

heat is applied very gradually until the collodion film turns brown. Air in the transferring water sometimes causes blisters. Use distilled, or well boiled and cool water; also it is well to add to the water a little sugar, or a little of the mucilage of quince seeds. These help to make the transfer adhere well to the plaque without blistering.

**Fluxes Fusible at Fairly Low Temperatures.**—Silica, 1 part; minium, 8 parts; borax, 2 parts. Or, Silica, 3 parts; minium, 6 parts; borax, 3 parts; saltpeter, 1 part. Mix thoroughly and fuse together in a crucible at a quick heat; well stir with an iron rod; spread upon metal plates to cool; pulverize and sift.

**White Enamel.**—Arsenic, 1 part; saltpeter, 1 part; silica, 3 parts; litharge, 6 parts.

**Black Enamel Powder.**—Flux as above, 2 to 3 parts; black oxide of iron, 1 part.

**Brilliant Black Enamel Powder.**—Flux as above, 2 to 3 parts; red or bright yellow oxide of iron, 1 part.

**The Substitution Process** of ceramic work is very difficult, and few people have worked it satisfactorily.

**Firing the Ceramics** is best entrusted to a china manufacturer. Alternatively, use a muffle furnace, and test the temperature with a tint test plate obtainable from the dealers who supply the colors.

**Watch Dials, Photographs on.**—For the production of photographic pictures on watch dials, the following method of procedure is recommended: Beat the white of an egg, with addition of a little ammonia, to a white foam; add 300 c.c. (9 oz. 3 dr.) of water and beat again. After the egg has settled, filter and let the liquid run once over the dial, which has previously been thoroughly cleaned with ammonia. After the surplus has run off, coat once more and allow to dry. The sensitive collodion is now produced as follows: Dissolve 0.6 gram (9 gr.) of chloride of zinc in 20 c.c. (5 dr.) of alcohol; add 0.5 gram of collodion cotton and 26 c.c. (6½ dr.) of ether, and shake the whole forcibly. Then dissolve 1.5 grams (22 gr.) of nitrate of silver in hot water, add 6 c.c. (1½ dr.) of alcohol, and keep the whole in solution by heating. The silver solution is now added in small quantities at a time to the collodion, which must have well settled. This, of course, is done in the dark room. After 24 hours the emulsion is filtered by passing it through cotton moistened with alcohol. This durable collodion emulsion is now flowed in the usual way thinly

### (Lantern Slides)

upon the prepared watch dial, which, after the collodion has coagulated, is moved up and down in distilled water until the fatty stripes have disappeared. The water is then changed once, and the dial is, after a short immersion, left to dry upon blotting paper. It is now ready for exposure. Expose under the original magnesium light and develop with a citrate oxalate developer, or with the following hydroquinone developer: Hydroquinone, 1 gr. (1 dr.); bromide of potassium, 25 grams (6 dr.); sulphite of soda, 48 grams (1½ oz.); carbonate of soda, 10 grams (2½ dr.); water, 450 c.c. (14 oz.). After fixing and drying, coat with a transparent positive varnish. In place of the developing process, the printing out process with chloride of silver collodion can also be applied, with the advantage that the pictures can be toned. The collodion for this purpose is made in the following way: Dissolve 8 gr. (2 dr.) collodion in 100 c.c. (3 oz. 1 dr.) of ether, and 100 c.c. (3 oz. 1 dr.) of alcohol; add 0.3 gram (45 gr.) of chloride of strontium, and then 0.2 gram (30 gr.) of chloride of lithium, which has previously been dissolved in 2 c.c. (½ dr.) of hot water. To this solution add also 1 gram (15 gr.) citric acid which has been dissolved in alcohol slightly heated. The solution is left standing for 24 hours, and is then filtered through cotton. The prepared dial is coated in the ordinary way with this emulsion, and printed, after which it is toned as usual.

### LANTERN SLIDES

**Gelatio-Chloride Emulsion for Lantern Plates.**—(a) Sodium chloride, 1½ oz.; gelatine, 2 oz.; water, 20 oz. (b) Silver nitrate, 3 oz.; water, 5 oz. (c) Gelatine, 2 oz.; water, 25 oz. Dissolve the gelatines in a water bath at a temperature of 120° F. Mix (b) and (c), and add (a) in small quantities at a time, stirring well all the time. Allow to stand for 10 min., and pour out in a dish to set; break up and wash in the usual way. For a warm-toned emulsion add 1 to 2 oz. of citric acid to (a). This gives a very slow emulsion, but by digesting the emulsion at 110° for half an hour greater rapidity is obtained, and the color of the pictures tends more towards browns and blacks.

**Chloro-Bromide Emulsion.**—Rinse 40 gr. of Nelson's No. 1 gelatine in 2 or 3 changes of water, and place in a jam pot with 4 oz. of distilled water. Heat gently, and add ammonium bromide, 110 gr.; sodium chloride, 30 gr.; hydrochloric acid

## Photography

### (Lantern Slides)

(10% solution), 10 minims. Test the ammonium bromide for acidity; if acid, neutralize with ammonia. Dissolve 200 gr. of silver nitrate in 1 oz. of distilled water. Add the silver solution in a very fine stream to the bromized gelatine, which should be kept at a temperature of 125° F., stirring all the time, and digest in a water bath at 150° for 10 min. Then add 175 gr. of hard gelatine which has been previously soaked and well rinsed in 2 or 3 changes of water and well drained. Set till firm, then cut up into small dice and hang in a canvas bag in a pail of water for half an hour, changing the water every 5 min. Well drain the emulsion, remelt, filter, and add tannin, 2 gr.

**Spotting.**—The standard spotting in Britain and the Colonies is with 2 round spots, of color distinct from that used for the binding, placed at the top of the picture, as viewed the same way round as it appears in nature. These spots go downward, and next to the condenser, in projecting. The American standard method is to spot with 1 "thumb-spot" at the bottom left-hand corner of the picture, as viewed in its proper direction. This spot is covered by the thumb of the right hand when the lantern is fed from the right-hand side, and is at the upper right-hand corner, next to the condenser, during projection.

**Azol Developer.**—Azol, 25 minims; potassium bromide (10%), 5 minims; water to 1 oz.

**Certinal.**—For ordinary lantern plates: Certinal, 1 part; water, 30 parts. For "gas-light" or "contact" plates: Certinal, 1 part; water, 15 parts. Nearly all negative developers can be used if diluted with an equal quantity of water and  $\frac{1}{4}$  gr. of potassium bromide added to every oz.

**Pyro-Ammonia (warm black tones).**—(a) Pyro, 20 gr.; potassium metabisulphite, 60 gr.; ammonium bromide, 20 gr.; water, 10 oz. (b) Liquid ammonia (.800), 80 minims; water, 10 oz. Use equal parts. Mix fresh for each slide. Or, (a) Pyro, 10 gr.; soda sulphite, 45 gr.; citric acid, 15 gr.; potassium bromide, 10 gr.; water, 10 oz. Add, per oz., at time of using, 30 minims of 10% ammonia solution. Requires full exposure. Mix fresh for each slide.

**Pyro-Carbonate for Various Tones.**—(a) Pyro, 1 oz.; soda sulphite (crystals), 3 oz.; citric acid,  $\frac{1}{4}$  oz.; water to 10 oz. (b) Liquid ammonia (.880), 1 oz.; water to 10 oz. (c) Ammonium bromide, 1 oz.; water to 10 oz. (d) Ammonium carbonate, 1 oz.; water to 10 oz. Take  $\frac{1}{4}$  oz.

### (Lantern Slides)

of (a) and  $\frac{1}{4}$  oz. of (b); adding, for black tones,  $\frac{1}{4}$  oz. of (c); for brown tones, 160 minims of (c) and 160 minims of (d); for purple tones, 1 oz. of (c) and 1 oz. of (d); and for red tones, 2 oz. of (c) and 2 oz. of (d); making up, in each case, to 8 oz. with water. All reduction, intensification, and toning methods applicable to bromide paper are applicable to slides.

**Metol-Hydroquinone for Warm Tones.**—Normal Developer: (a) Metol, 41 gr.; hydroquinone, 22 gr.; sodium sulphite, 1 oz.; sodium carbonate, 1 oz.; water, 20 oz. (b) Ammonium carbonate, 1 oz.; ammonium bromide, 1 oz.; water, 10 oz. (c) Hypo, 1 oz.; water, 10 oz.

**Physical Development.**—Plates should be quite fresh, and dishes perfectly clean. Exposure about 4 times normal. Metol, 88 gr.; citric acid, 1 oz.; water, 10 oz. To every oz. add 48 minims of 10% silver nitrate solution, just before applying to plate. The silver may deposit everywhere and all over the plate, but on scrubbing hard with cotton wool this is removed, leaving image of bluish tone and great delicacy and transparency. The operation may be repeated if necessary.

**Warm Tones by Redevelopment.**—Bleach rather thin slide in potassium bichromate,  $\frac{1}{4}$  oz.; hydrochloric acid,  $\frac{1}{2}$  oz.; water, 10 oz. Wash well, and redevelop with any warm-toned developer. All the toning methods applicable to bromide paper are applicable to lantern slides.

**Adhesive for Binding Strips.**—Sugar candy (240 gr.) in hot water (1 oz.), and stir into Le Page's fish glue (2 oz.). Brush on to thin "needle" paper, dry, and cut into strips. Or, Apply to the strip at time of use thin glue with a little oil of lavender added.

**When Mounting,** warm the slide to make it thoroughly dry, and thus increase its permanency. Damp slides may melt in the lantern.

**White Ink for Writing on Slides.**—Rub up artists' zinc white with water containing about 40 gr. of gum arabic per oz.

**Tinting Lantern Slides.**—Aniline colors may be used, these acting more as stains than colors. The better-class workers use oil colors in tubes, care being taken to employ only those that show their true tint when viewed by transmitted light. The most useful are gamboge, Italian pink (yellow), burnt and raw sienna, Prussian blue, crimson lake, and red madder. Thin with copal varnish.

## Photography

### (Spotting Prints)

#### Lantern Slide Diagrams.

Draw with hard pencil on fine ground glass, and varnish with strong solution of gum dammar in benzole. Or, Flow a matt varnish of sandarac, 10 gr.; gum mastic, 10 gr.; methylated ether, 1 oz.; and benzole, 100 minims, over plain glass. The matt surface takes the pencil well and the slide is made transparent again with: Sandarac, 15 gr.; gum mastic, 15 gr.; methylated ether, 1 oz. Or, Use etching ground: Canada balsam, 4 parts; rectified turpentine, 8 parts; liquid siccatif, 1 to 2 parts; plus lampblack or dropblack, sufficient to give a consistency of thick cream. Coat evenly with a badger's hair softener, to give an intensely opaque, even film. Diagrams can be sketched thereon, then scratched through with a needle or fine stylus. Or, Etching ground: Yellow ochre, 100 gr.; white dextrine, 150 gr.; sal ammoniac, 10 gr.; water, 75 minims; alcohol (methylated), 25 minims. Mix alcohol and water, and with them mull up the color on a slab, or grind it in a mortar. Coat the glass with a printer's roller or a roller squeegee.

**Black for Diagram Making.**—Benzole, 1 to 1½ oz.; bitumen, 4 dr.; ivory black, 5 dr.; beeswax, 2 scruples.

### SPOTTING, COLORINGS, ETC., PRINTS

**Print Varnish.**—Borax, 15 gr.; pale yellow shellac, 30 gr.; soda carbonate, 5 gr.; glycerine, 15 minims; water, ½ oz. Boil, cool, and add alcohol, ½ oz. Add pumice powder or whitening, to throw down lac wax, shake up, allow to stand 2 or 3 days, and filter.

**Preservatives for Medium.**—Alcohol, alum, acetic acid, carbolic acid, etc., are given as preservatives for media containing animal and vegetable substances liable to decompose. To keep these mixtures for any long time, however, they should be in bottles with well-fitting corks that have been soaked for a long time in hot paraffine wax.

**Preparing for Coloring.**—For greasy, thumbred prints, use ox-gall; for albumen prints, use an albumen medium.

**Gum Medium.**—Colorless gum arabic, 2 oz.; sugar, 1 oz.; alcohol, 1 fl. oz.; alum, ¼ oz.; water, 20 fl. oz. Filter after complete solution.

**Colored Media.**—Some tints like to use three-colored media and a small number of colors. There are some advantages in this when coloring large numbers of cheap prints (post cards, etc.). Yellow

### (Coloring Prints)

medium and blue pigment gives washes of green, etc. Yellow: Saturated solution of picric acid; deepen the color by adding a small quantity of ammonia. Red: 5% solution of safranin G (best bought in alcoholic solution and diluted with water). Blue: Indigotine, or methylene blue, in a weak solution of albumen.

**Ammoniacal Medium.**—Media made with ammonia must not be used with certain colors (e.g. Prussian blue.).

**Albumen Medium for Water Colors.**—1 oz. of albumen; 4 gr. of common salt; 2 gr. of quinine sulphate; 4 gr. of gum arabic; and water to make 2 oz. Dissolve the gum in the water before mixing with the other ingredients. Or, White of 1 egg; common salt, 4 gr.; gum arabic, 4 gr.; quinine sulphate, 4 gr.; water to 2 oz. Water colors in powder are mixed with these media.

**Ox-Gall Medium.**—Purified ox-gall paste, 60 gr.; distilled water, 16 oz.; rectified spirit, 4 oz. Apply with flat camel's-hair brush; when dry, prints will take both oil and water color.

**Quillai Bark Medium.**—Quillai bark in coarse powder, 1 oz.; boiling water, 10 oz. Let stand 12 hours, filter, and add salicylic acid (50 gr.) dissolved in rectified spirit, 10 oz. Keep well stoppered and apply with a brush to print, lantern slide, or plain glass, which will then take any color.

**Medium for Oil Colors.**—Gum mastic, 1 oz.; turpentine, 10 oz. Tube oil colors are mixed with this medium. If rapid drying is desirable, the mastic may be dissolved in 4 oz. of chloroform.

**Prepared Glazed Print for Painting.**—Dissolve 1 oz. of freshly bleached lac in 10 oz. of methylated spirit. Filter through paper and apply to print by means of spray diffuser.

**Spotting Bromide Prints.**—Mix together Payne's gray and Indian ink (the color should match that of the film).

**Preparing Bromides for Working Up in Crayon.**—Fine pumice powder applied with the palm of the hand.

**Preparing Carbon Prints for Oil Coloring.**—Brush with: Isinglass (180 gr.), soaked for 2 hours in water (10 oz.). Dissolve on water bath; add methylated spirit (10 oz.), with stirring.

**Aniline Dyes for Tinting.**—Packet dye, 1 packet; glacial acetic acid, 2 dr.; water to 2 oz. Apply with brush.

**Glossy Colors for Prints.**—Water colors or transparent aniline dyes, the gloss being determined by the amount of strong gum (or albumen) solution added.

**Tinting Albumen Prints.**—Apply a size

## Photography

### (Coloring Prints)

made by dissolving gelatine in acetic acid until it forms a pasty mass and then thinning it to 1 part of acetic gelatine in 8 parts of water. Color with aniline or water colors.

**To Remove Oil Stains from Prints.**—Apply pure benzole and blot off a few seconds later with clean white blotting paper. Repeat.

**Spotting Medium for Printing Out Papers.**—Rouge and ivory black (in proportions suited to the tone of the print), 10 parts; saturated solution gum arabic, 2 parts; white honey, 2 parts; powdered sugar candy, 1 part. Mix thoroughly in a mortar and use in the same way as water color. An addition of indigo is favored by some workers.

**Spotting Printing-Out-Paper Prints.**—Add a little carmine to the above. When mixture is dry (on the palette) work in a strong solution of gum, rubbing the brush one way only, to avoid making air bells. If the prints are to be enameled or glazed by stripping after spotting, then artists' oil colors with benzole in which gum dammar has been dissolved, or water colors, may be used with shellac water varnish.

**Spotting Prints to be Enameled or Squeezed to Glass.**—Oil color, with a medium of: Dammar,  $\frac{1}{4}$  oz.; turpentine, 5 oz. Or, Artists' oil colors in tubes, thinned with benzole and dammar (or copal) varnish.

**Encaustic Paste or Cerate.**—Pure beeswax, 500 parts; gum elemi, 10 parts; benzole, 200 parts; essence of lavender, 300 parts; oil of spike, 15 parts. Or, Beeswax, 100 gr.; dammar varnish, 40 minims; pure oil of turpentine, 100 minims. Melt, and amalgamate by thorough stirring.

**Wet-Effect Varnish and Size.**—Sandarac, 1 oz.; benzole, 4 oz.; acetone, 4 oz.; absolute alcohol, 2 oz. Allow to stand with occasional agitation till dissolved, then allow to stand some days till it settles quite clear, or filter. Brush the print freely with this; blot off excess. Or, Use any of the following: (a) Artists' size, diluted with warm water; applied freely. (b) Megilp, a somewhat similar material, similarly used. (c) Fixative. A suitable mixture for this purpose is made by diluting 1 part of mastic varnish with 8 parts of alcohol. (d) For stronger effects ordinary negative cold varnish or gum arabic mucilage may be locally or generally applied with a brush. (e) Swell 20 gr. of gelatine in an oz. of cold water, and melt by gentle heat. Soak the print in this and hang

### (Crystoleum)

up to dry. (f) 20 parts of white wax; 15 parts of gum elemi; melt on water bath, and add 1 part of oil of spike. Remove from all flame or fire, and stir in 30 parts of alcohol and finally 15 parts of benzole.

**Waxing Solution.**—For Carbon Prints, or for Removing Collodion Films.—Beeswax, 40 gr.; benzole (rectified), 8 oz.

**Lubricator for Hot Burnishing.**—1.—Cetaceum, 1 part; Castile soap, 1 part; alcohol, 100 parts.

2.—Glacé Lubricator.—If a greater polish is desired than can be produced by the ordinary soap and alcohol lubricator, the following may be employed: Alcohol, absolute, 4 fl.oz.; Castile soap (white), 25 gr.; spermaceti, 25 gr. Dissolve by heat; add 1 fl.oz. of chloroform. Apply in the usual manner. Dry thoroughly, and remove all traces of the lubricator with a piece of Canton flannel. Burnish; have the burnisher quite hot.

3.—Burnishing Solution.—Castile soap, 4 gr.; alcohol (80%), 1 oz. Rub on the surface of the print, allow to dry, then burnish.

**Crystoleum.**—Adhesive.—A clear solution of gum arabic is used. Ordinary gum arabic has a yellowish tint, but this may be got rid of by boiling and exposing to air and sunlight.

**Clearine.**—For making the print transparent. Dissolve  $\frac{1}{2}$  oz. of pure Canada balsam in 3 oz. of benzine or chloroform (the former is the cheaper).

**Preservative.**—Used to prevent fading and appearance of white blotches which occur when the print actually comes into contact with the photogram. Gum copal, in small lumps, is heated to about 400° F., volatile oils being driven out. The residue is taken and mixed with boiled linseed oil until dissolved (three or four hours); when the solution is so viscous that it can be "pulled" just like transparent elastic, the addition of linseed oil is concluded. Thin down with turpentine if necessary.

**Another Method.**—Adhesive.—Add 1 oz. of clear gelatine and 1 oz. of acetic acid to 1 pt. of water and boil until dissolved.

**Clearine.**—Mix thoroughly 3 oz. of castor oil with 1 oz. of alcohol.

**Preservative.**—Mix thoroughly 4 oz. of olive oil, 1 oz. of turpentine and 1 oz. of Canada balsam.

**Prints for Crystoleum** should be deeply printed and warm-toned; preferably printing out papers or albumen.

**The Crystoleum Squeegee** is made of thin flat wood or bone (a tooth-brush



## Photography

### (Mountants)

handle, for instance), one end sandpapered to a rounded flat end, the other to a rounded curved end.

**Mounting.**—Soak the print and blot off. Smear the glass with the smallest possible quantity of fresh starch paste or photo-mountant and the face of print similarly. Lay pasted surfaces in contact and gently press together with finger-tips, beginning at center. Lay a piece of thin writing paper on the print and gently squeeze from center to edge. Dry thoroughly but slowly.

**Removing the Paper.**—Grind away with fine emery cloth, cut to small round patches fitting a finger-tip and working in small circles all over the print until very little paper remains.

**Translucing.**—Make the glass and print hot enough to melt solid paraffine wax, smear print therewith and rub well with a paraffine-waxed linen or fine cotton rag until the print is filled and a thin film of wax remains all over. When cool, but not set hard, polish with waxed cloth.

### Mountants and Mounting. (See also CEMENTS, PASTES, ETC.)

In preparing mountants, where starch, arrowroot, dextrine, etc., are used, always rub down to a smooth paste with a little water and a spoon or fork before adding boiling water or heating the mixture to swell the grain. With gelatine, swell in cold water, then warm gently until dissolved in a jacketed pan or on a water bath. In stirring pastes always stir in one direction the whole time of cooking; never reverse. (See also CEMENTS, GLUES, PASTES, ETC.)

**Arrowroot-Gelatine.**—Bermuda arrowroot, 8 oz.; water, 4 oz.; and soften Nelson's No. 1 soft gelatine, 360 gr., in water, 64 oz. Mix both in enameled iron saucepan and boil for 5 minutes. When cool add methylated spirit, 5 oz.; carbolic acid (liquid), 25 minims. Strong adhesive. Used cold. Keeps.

**Starch-Gelatine.**—Wheat starch, 2 parts; rice starch, 1 part; mix thoroughly in a mortar. Gelatine, 50 gr.; water, 10 oz. Swell and dissolve by heat. Cool to about 65° F., then add the mixed starches in small quantities, stirring until about the consistency of thin cream is formed. Heat slowly in a jacketed pan until the starch thickens, and continue boiling, stirring constantly, until about one-fifth of the water has evaporated. Add slowly, with constant stirring, alcohol, 1 oz.; oil of cloves, 50 minims. A stiff, perfectly smooth paste, which causes almost no cockling if carefully applied.

### (Mountants)

**Starch-Dextrine.**—Dextrine, 1 oz.; hot water, 1½ oz.; starch, 1 oz.; mixed with cold water, 1½ oz. Add dextrine to starch gradually and heat on water-bath till whole jellifies. When cold, add thymol, 2 gr. per oz. weight.

**Gulliver's Paste** keeps very well indeed; does not cockle prints and will not thicken. Pound 1 oz. of white gum arabic and mix with 4½ oz. of dextrine, add 16 oz. of boiling water, a little at a time, and then boil the mixture in an enameled pan for about 15 minutes. Allow to cool; add ammonia, 10 drops, and bottle for use.

**Dextrine.**—Dextrine, 25 oz.; alum, 1 oz.; sugar, 4 oz.; water, 30 oz.; carbolic acid (10% solution), 1½ oz. Keeps well; great adhesion; cockles the mount very little and permits print to be moved about.

**Gelatine, Non-cockling.**—Soak sheet gelatine, 4 oz., in water, 16 oz. till soft, melt on water-bath, add methylated spirit, 5 oz., in thin stream, stirring rapidly, and, lastly, glycerine, 1 oz. To apply, rinse clean ground glass in hot water, drain and brush over with hot mountant. Lay print face up on glass, rub lightly down through piece of clean paper, remove and lay on mount. Prints stick firmly and mounts do not cockle by this plan.

**Liquid Gelatine.**—Swell Cologne glue or gelatine, 1 part, in water, 6 parts; dissolve on the water-bath and add chloral hydrate, 1 part. Heat for a short time and neutralize the sticky fluid with a few drops of soda solution.

**Gelatine for Thin-leaved Albums.**—Sheet gelatine, 1 oz.; water, 4 oz. Melt, cool and add methylated spirit, 1¼ oz., very slowly and stirring constantly. Then add glycerine, ¼ oz.

**Shellac Mountant for Thin Mounts.**—Make a strong solution of shellac in methylated spirit. Apply to print and mount in a thin film and rub into contact. Does not cockle the thinnest mount.

**Backing Varnish** (to prevent loss of gloss or cockling during mounting).—Bleached lac, 1 oz.; methylated spirit, 20 oz. Break the lac small, wash well, then dissolve with occasional shaking. Powdered borax, 2 dr.; Castile soap, 2 dr.; warm water, 2 oz. Dissolve, mix with the lac solution, settle and decant.

**Dry Mounting Sheets.**—Gum sandarac, 10 parts; copal, 3 parts; orange shellac, 4 parts; rosin, 3 parts; Venice turpentine, 2 parts; alcohol, 11 parts; spirits of turpentine, 11 parts. Wax a sheet of glass, laying tissue paper thereon, and paint freely with the above mixture. Al-

## Photography

### (Mountants)

low to dry and strip. The paper thus treated is cut to size, laid between the print and mount and ironed with a hot flat-iron.

**Dextrine Dry Mountant.**—When sufficient heat and pressure are available, prints may be mounted perfectly by powdering the backs with fine dextrine and hot-pressing them into contact with the mounts.

**Dry Mounting.**—Dip thin tissue paper in a solution of shellac in methylated spirit and dry. Fix print to tissue by a touch with a hot iron, then trim print and tissue together. Lay tissue print on mount, cover with clean blotting paper and press with a flat-iron, not so hot as for ironing linen. If too hot, print and mount will curl up. If too cool, they will not adhere.

**Directions for Dry Mounting Photographs.**—A solution of shellac in alcohol is prepared by pouring the spirit over the shellac and slightly heating the solution in a water bath. The solution, which must not be too thick, is spread uniformly with a brush over the back of the photograph. When dry, the photograph is laid on the cardboard, covered with a thin linen cloth and a hot flat-iron passed over it; it will immediately adhere firmly and neatly to the cardboard. The many disadvantages of wet mounting are avoided by this process. Another method is similar to that described above, differing only in the composition of the dry adhesive. A piece of tissue paper is coated by means of a broad brush with the following solution: White gum lac, 30 parts by weight; gum elemi, 3 parts by weight; Canada balsam, 5 parts by weight; alcohol (91°), 100 parts by weight. After drying for about 15 minutes, the other side is coated and likewise dried. The piece of paper thus treated is placed between the photograph and the cardboard and a hot flat-iron passed over it. The sheets will adhere perfectly without warping or stretching and the photograph will be protected against any damage from sour paste. By again applying heat the photographs may easily be separated from each other.

Temperatures recommended, not higher than: Carbon and "gum" prints, 140° to 150° F., 60° to 65° C.; gelatino-chlorides, lightly alumed, 160° F., 70° C.; gelatino-chlorides, strongly alumed, 165° to 175° F., 75° to 80° C.; collodio-chlorides, 185° F., 85° C.; bromide, 185° to 195° F., 85° to 90° C.; albumen, 195° F., 90° C.; platinum, plain salted silver, and other prints with matt faces and no gelatine, 195° to 205° F., 90° to 95° C.

### (Enameling Prints)

These are for a dwell of 5 seconds. Slightly lower temperature and longer dwell are recommended as a rule. Very thick papers should have low temperature (140° F.) and long dwell.

**Unmounting Dry-Mounted Prints.**—Heat a metal plate to 250° or 300° F. (120° to 150° C.) and lay the mount upon it. When hot, press a corner of the print with a clean flannel until loose, then raise this corner and press another part.

**Mounting Prints on Glass.**—This method of making brilliant prints for "opaline" and framing purposes depends upon manipulation rather than formula. Use a hot solution of gelatine, 1 oz., in 20 of water. Have the glass perfectly clean and hot, soak the print in the gelatine solution for a minute or two, slip the hot glass under the print, withdraw them from the solution together, and squeeze the print into contact with a flat squeegee. Want of attachment is due to (a), air-bells; (b), cooling of the gelatine too soon and before the squeegeeing is complete; (c), careless handling of the mounted prints before the gelatine is set hard; or (d), dirtiness or greasiness of the glass.

**Mounting Prints on Celluloid.**—Float dry print on and coat celluloid with collodion, 30 gr.; amyl acetate, 1 oz. Squeegee together.

**Mounting Paper on Metal.**—Tragacanth, 3 parts; gum arabic, 12 parts; water, 50 parts. Or, Gum acacia, 10 parts; water, 20 parts; aluminum sulphate (hot alum), 1 part.

**Varnish for Prints on Wood.**—Canada balsam and turpentine, equal parts, melted together in a warm place. Apply two coats with stiff brush. Or, Size the prints with a coating of thin gelatine solution, allow to dry, and then apply artists' copal varnish. This dries glossy and has a hard surface less liable to injury than Canada balsam.

**Enameling Photo Prints.**—Use very clean plates and rather larger than the prints to be enameled. Wipe them well, rub them with tale and remove the excess with a soft brush passed lightly over the surface. In a dish, half filled with ordinary water, immerse the photographs and allow them to soak. This being done, coat one of the tacked plates with enameling collodion in the ordinary way, agitate to cause the ether to evaporate, and when the film has set—that is to say, in a few seconds—steep this plate, the collodionized surface up, in a second dish containing pure water. Now take one of the prints in the first dish and apply the

## Photography

### (Glossing Prints)

printed side to the collodion, remove the plate from the dish, keeping the print in its place with the finger of the left hand, and remove the air bubbled by lightly rubbing the back of the photograph with the forefinger of the right hand. Care has been taken beforehand to prepare some very pure starch paste, passed through a cloth, and some thin cardboards, or simply thick paper, the size of the plates used. The air bubbles having completely disappeared, and the perfect adherence of the print ascertained, dry with bibulous paper and spread over the prepared cardboard on paper a coating of the collodion by means of a flat brush. Apply this sheet on the print, pass the finger over it to obtain complete adherence, and give it 24 hours to dry. At the expiration of this time cut with a penknife the cardboard or paper even with the print and detach by one corner. If the plate has been well cleaned, the print will come off itself. We get in this manner a very brilliant surface, and as solid as that obtained by the use of gelatine, which, as it is seen, is entirely done away with in this process. The prints are afterward mounted on thick cardboard in the usual way. It is possible, by mixing with the collodion some methyl blue dissolved in alcohol (a few drops are sufficient), to obtain moonlight effects, especially if a rather strong negative has been used. For sunsets make use of an alcoholic solution in coccineine.

**Glace Prints.**—Apply the prints face down while wet to the smooth varnished side of a ferrotype plate, squeezing it by rolling a rubber roller over the back, having blotting paper between the print and paper. When dry, it will have a high polish and drop off the sheet. The polish is called glace finish. To mount such prints without losing the gloss, make the following mounting solution: Soak 1 oz. refined gelatine in cold water for an hour, then drain off and squeeze out the water as much as possible; put the gelatine in a jelly pot and place the latter in a pan of hot water on the fire; when the gelatine has melted, stir in slowly  $\frac{1}{2}$  oz. pure alcohol and bottle for use. This glue will keep indefinitely and can be melted for use in a few minutes by standing the bottle in a basin of hot water. As it contains a very small percentage of water, it hardly affects the gloss of the prints and dries almost immediately.

**To Gloss Prints.**—Give the glass a good washing with soap and water (using an ordinary nail brush). When thoroughly clean rinse under the tap. Now

### (Orthochromatic Photography)

take a print (which must have been soaking in a dish of clean water for 3 or 4 minutes), place it face downward on the glass and squeegee. When partly dry, mount a piece of backing paper on print, then set up to dry. It is not necessary that the prints should have been through an alum bath, provided they are not put on glass direct from the washing water. They must be allowed to dry first and then damped just before putting on glass, as the film is too soft after being 1 or 2 hours in water. After standing on a mantelpiece for about 3 hours, the prints will leave the glass without any trouble, and they will have a gloss free from marking caused by small particles of chalk, etc., sticking to glass.

**Glazing Gelatine Prints.**—Many amateurs are troubled by having their prints adhere very firmly to the glasses to which they have been squeegeed for glossing. In some cases this is caused by putting them on the side of the glass which was not prepared for them. To remedy this, paint a large B with Brunswick black on the back of the glass. This will insure the same side always being used. Pieces of paper put on for this purpose are often washed off. To clean the glasses thoroughly take a few drops of solution made by dissolving 30 gr. spermaceti wax in 5 oz. of benzine and rub it all over the glass with a piece of paper until the surface is polished. Repeat this every time the glass is used.

## ORTHOCHROMATIC PHOTOGRAPHY

### Light Filters.

Yellow and orange light filters of pot-metal glass of the cheaper kind are made by stirring a bar of wood in the molten glass. The charred wood gives a brownish-yellow color, but it also gives a good deal of black carbon, so that a light filter of a given intensity, judged by the extent to which it lengthens the exposure, does not give nearly such good color correction as a pot-metal colored in a different way, which would lengthen the exposure to the same extent. This is one reason why it is not wise to buy the cheapest kind of orthochromatic light filter.

**Methods of Making Color Filters.**—1.—With collodion film on glass.—Dissolve celloidin chips (90 gr.) in alcohol, 5 oz.; ether, 5 oz. To this collodion add the dye (see later). Shake well and allow to stand a day or two. Pour off the clear collodion and flow over the glass plate, previously cleaned with ammonia, and then with alcohol. In place of collodion,

## Photography

### (Light Filters)

celluloid in amyl acetate, or ordinary spirit varnish, may be used. Collodion screens are very liable to fade.

2.—With Gelatine Film on Glass.—Swell best transparent gelatine in eight times its weight of cold water. Liquefy, filter through a hot-water funnel and add dye solution in carefully measured dose. Warm flat plate glass (at least 7-32 in. thick) on warm iron plate and pour over gelatine solution. Leave to set, and when dry cement to flat cover-glass with Canada balsam. If the filters are used close in front of the plates, ordinary dry plates may be fixed and dried, and soaked in the dye solution.

3.—Gelatine Films Stripped from Glass.—Clean a piece of glass thoroughly and flow over 1% solution of white wax in benzole, and rub almost all off with a tuft of cotton wool. Soak 220 gr. Heinrich's gelatine in 10 oz. water, liquefy at 105° F. and filter warm. Flow over the leveled plate and leave to set. When dry flow over aurantia collodion or aurantia negative varnish. Leave to dry and again flow on the gelatine solution. Leave to set and dry, cut round the edges, strip off and fix in a stop of the lens.

Method No. 2 is the best.

*Yellow Light Filters for Plates Sensitive to Yellow and Green.*—1.—Tartrazin, of the Badische Anilin und Soda Fabrik. Add a 1% solution to the gelatine solution given under (2) above. Test depth by photographing a test chart. Dark Prussian blue should be clear glass in the negative and chrome yellow-black. Tartrazin gives a beautifully bright screen, requiring very little extra exposure.

The newer dye, rapid filter yellow K, is even better than tartrazin, and may be used in the same way.

Brilliant yellow gives a gradual absorption and may be used in increasing strength according to the depth of filter required.

2.—Aurantia used as per method (1) above gives a good light filter. About 1½ gr. per oz. of collodion is an average. For deeper screens increase the dye. The blue is cut off gradually, according to depth of tint.

3.—Naphthol-yellow, used in collodion, cuts off the blue sharply about the blue-green.

*Orange Filter for Plates Sensitive to Red.*—Add "Echtes Rot" or Rose Bengal and tartrazin in proportion of 1 or 1½ to 10 to gelatine solution given above.

*Bichromate of Potassium Filter.*—One of the simplest light filters is a solution of bichromate of potassium contained in a

### (Light Filters)

cell. This will do for almost all ordinary orthochromatic work, as it may be made of any strength according to the color of original, a saturated solution being orange-colored and serving for red-sensitive plates, or it may be diluted to make the palest screen for landscape work on yellow and green-sensitive plates.

*Filters for Three-Color Negatives.*—According to Miethe, filter and plate should be so adjusted that the blue record extends from 4,900 to 4,900, the green record from 4,900 to 5,890, the red record from 5,890 to 7,000. According to Newton and Bull, the records should have some overlap and are as follows: Blue, 4,000 to 5,000; green, 4,600 to 6,000; red, 5,800 to 7,000.

Wet filters giving the latter absorptions:

Blue Filter.—Victoria blue B (Bayer), (1:100 solution), 23 parts; naphthol-green (1:100 solution), 9 parts; water, 460 parts.

Green Filter.—Rapid filter green (1:100 solution), 4 parts; naphthol-green (1:100 solution), 4 parts; rapid filter yellow K (1:100 solution), 4 parts; water, 460 parts.

Red Filter.—Rose Bengal (1:100 solution), 46 parts; rapid filter yellow K (1:100 solution), 46 parts; water, 460 parts. These solutions are used in cells of cm. thickness. The blue filter does not keep in solution. It is therefore generally the practice to use a non-color sensitive plate for the blue record and substitute a 1% solution of quinine sulphate in water acidified with sulphuric acid for the blue filter.

Dry filters may be made by coating plate-glass carefully leveled with gelatine as in (2) above, and then staining up in dye solutions made up as above, but with less water, until a test by spectrum photograph shows that absorptions are correct. The most scientific way to make the filters is to add the dye in measured quantity to the gelatine solution and carefully coat a given area of glass with given amount of dye to give the exact absorption required.

These filters are probably the best for all-round color work, whatever plates are used. The best plate is a panchromatic plate for all three negatives. If home-bathed plates are used, then an ordinary plate may be used for blue record negative, a plate bathed in pinachrome for green and one bathed in pinacyanol for red. Where only one class of plate is used, then one bathed in pinachrome is best, or one bathed in a mixture of pina-

## Photography

### (Light Filters)

chrome and pinacyanol, taking of the stock solutions 3 parts of former to 2 of latter.

The above filters will also do for collodion emulsion, or the following may be substituted for the blue filter if "A" sensitized emulsion is used: 1% rhodamin, 2 parts; water, 100 parts.

**Trichrome Filters.**—The ratio of three-color filters should be determined by photographing black, white and a scale of grays, which should come alike on all three negatives. The exposures should be made under the same conditions of light and sensitive material that are proposed when making the actual three-color exposures.

**Light Filters and Prints.**—The red filter negative is the blue printer; green filter is red printer; blue filter is yellow printer.

**Order of Printing the Colors.**—Usually yellow, red, blue. The color printed last is generally the most predominant.

**The Sanger-Shepherd, Pinachrome, Lumière, Rotary and Other Processes.**—Instruction in booklets obtainable from the respective firms.

**Sensitizing Trichrome Tissues.**—Potassium bichromate, 1 oz.; water, 30 oz.; ammonia, .880, about 1 dr. Add ammonia until the solution changes to a clear yellow and just turns red litmus paper faintly blue. For hard, strong negatives, 2 oz. bichromate to 30 oz. water; for soft, flat negatives,  $\frac{1}{2}$  oz. bichromate. If printing by enclosed are lamps, bichromate must be much lessened in amount.

**Dyes for Tri-Color Transparencies by the Staining Method.**—For blue: Thio blue A, or soluble Prussian blue, slightly acidified with sulphuric acid. For pink: A mixture of eosin and rhodamin pink. For yellow: Best brilliant yellow or aniline yellow. For blue: Methylene blue, 16 gr.; cold water, 4 oz. For pink: Magenta red, 16 gr.; hot water, 4 oz.; acetic acid, 10 minims. For yellow: Ammonium picrate, saturated solution. Rinse in each case with water made acid with acetic acid.

**Cement for Tri Color Films.**—Gelatine, 150 gr.; acetic acid (glacial), 150 minims; water, to 10 oz. Soak the gelatine until swelled, heat in jacketed pan at 150° F. until dissolved and add slowly, with constant stirring and keeping up the temperature, methylated alcohol, 26 oz. Heat before use; paint freely over the transparency or print; have the next image well drained and surface dry, ready to lower on to the first one as soon as the cement becomes just tacky. Or, Use

### (Lumière Process)

white dextrine, gum or almost any transparent mucilage.

**Colors of Printing Inks for Three-Color.**—Theoretically correct colors (non-permanent): Yellow, pink and blue-green. Inks: Cadmium or light chrome yellow, rose lake and greenish peacock blue. Nearest correct (permanent) colors: Yellow, madder lake and turquoise blue.

**Pinatype Three-Color Light Filters.**—(a) Gelatine, 384 gr.; water, 10 oz. (b) Crystal violet, 5 gr.; distilled water (warm), 1 oz.; acetic acid (glacial), 1 drop. (c) Rapid filter green I, 5 gr.; distilled water (hot), 1 oz. (d) Rapid filter red, 12 gr.; distilled water (hot), 1 oz. Take 1 oz. of (a), with 96 minims of (b), (c) and (d), for the blue, green and red filters respectively. Use 120 minims of dyed gelatine to every 16 square inches of glass, or  $7\frac{1}{2}$  minims per square inch. Each filter consists of 2 glasses of the same color, bound face to face.

**Pinatype Print Plates.**—Hard gelatine, 185 gr.; chrome salt (ammonium bichromate), 31 gr.; water,  $10\frac{1}{2}$  oz.; alcohol, 1 oz. Is sensitive to light and ready for use as soon as dry.

**The Lumière Process.**—**Light Filters.**—Plates coated with warm 10% gelatine solution (5 c.c. for each 10 sq. cm. of surface) are dyed 5 minutes at 70° F., rinsed and dried, two of each being cemented together with Canada balsam. **Green Screens.**—Methylene blue ( $\frac{1}{2}\%$  sol.), 5 c.c.; auramine G ( $\frac{1}{2}\%$  sol.), 36 c.c. For "A" plate. **Blue-Violet Screen.**—Methylene blue ( $\frac{1}{2}\%$  sol.), 20 c.c.; water, 20 c.c. For blue label plate. **Orange Screen.**—Erythrosin ( $\frac{1}{2}\%$  sol.), 18 c.c.; metanile yellow (sol. saturated at 60° F.), 20 c.c. For "B" plate.

**Safe Light.** For "A" plate, weak red. For "B" and blue label, faint green.

**Paper for the Positives.**—Edge a glass plate with masticated rubber, 40 gr.; benzole, 10 oz. Dry and coat with collodion as follows: Alcohol, 5 oz.; ether, 6½ oz.; pyroxylin, 55 gr.; castor oil, 15 minims. Edge glass with rubber and coat with collodion. When dry, paper is squeezed into contact. After drying, surface of paper is waterproofed with varnish, and after receiving gelatine coating is stripped from glass for use. Mount paper on glass by immersing both (barryta-coated side in contact with collodion) in 7% gelatine solution at 145° F. Let dry for 12 hours and coat with gelatine mixture, allowing 5 c.c. per 13 × 18 cm. plate (=  $4\frac{1}{4}$  × 7 in.).

**Gelatine Mixture.**—Water, 1,000 parts; emulsion gelatine, 120 parts; hard glue

## Photography

### (Lumière Process)

(Coignet's), 120 parts; ammonium bichromate, 60 parts; potassium citrate (25% sol.), 40 parts; cochineal red, 1 part; alcohol, 200 parts. Soak gelatine and glue in the water 12 hours, melt at 120° to 140° F., cool to 95° F. and add then in order given, with constant stirring, ammonium bichromate, potassium citrate and cochineal. Add the alcohol little by little, and filter through a fine cloth. Place plates on leveling slab to set, dry at temperature not above 68° F., time of drying being not more than 12 hours.

**Exposure of Positives.**—Papers are stripped from their glass supports when dry and exposed as in carbon printing.

**Development of Positives.**—Collodionize glass plate and coat with rubber solution (20 gr. in benzole, 10 oz.). Immerse plate and print in ice water for 15 or 20 seconds, bring into contact, and squeegee. Put under pressure for 5 or 10 minutes, soak in cold water for 2 hours, then in water at 100° F. for half an hour, when the paper support will leave the print. Develop as usual in carbon work, wash in cold water, place in alcohol for 5 minutes and dry.

**Staining Positives.**—Immerse for 12 hours at ordinary temperature in red bath for green screen positive: Water, 1,000 parts; erythrosin J (3% sol.), 25 parts. Blue bath for orange-green positive: Water, 1,000 parts; diarsine F (3% sol.), 50 parts; hard glue (15% sol.), 70 parts. Yellow bath for violet-green positive: Chrysophenine G, 4 parts; water, 1,000 parts. Dissolve at 160° F. and add alcohol, 50 parts. After staining, wash briefly in cold water to remove excess of dye. Immerse red and blue prints in 5% copper sulphate solution. Rinse and dry all three.

To reduce red or yellow images, soak in water. To reduce blue image, soak in  $\frac{1}{2}$ % or 1% glue solution. To reduce red greatly, use 5% ammonium solution. To intensify red, soak in erythrosin solution.

**Combining Positives.**—When color effect is right, coat the surface of prints with 1 in 5 rubber solution, let dry, and coat with 1% collodion. Coat paper with 15% hard glue solution and apply to yellow positive. Dry, strip off the paper (which brings with it the yellow film), apply the latter to the blue positive, using as mountant water, 1,000 parts; hard gelatine, 120 parts; glycerine, 50 parts. Use warm, immersing yellow image and blue image (on glass). Bring into contact, register and squeegee. When dry, strip paper from glass, bringing blue and

### (Lumière Process)

yellow films thereon. Apply this to glass bearing red image, using same solution of gelatine and glycerine. The paper on stripping will bear the three films, which are transferred to glass by means of the gelatine and glycerine solution.

**Autochromy.**—The new simplified method. The developer (aa:bb) given in next paragraph may be used in place of quinomet.

**Developer.**—Distilled water, 1,000 c.c. or 35 oz.; quinomet, 15 grams or  $\frac{1}{2}$  oz.; anhydrous soda sulphite, 100 grams or  $3\frac{1}{2}$  oz.; ammonia, 32 c.c. or 9 dr.; potassium bromide, 6 grams or 90 grains. Dissolve the quinomet in warm water (about 100°), add sulphite and then ammonia.

**Reversing Bath.**—Water, 1,000 c.c. or 35 oz.; potassium permanganate, 2 grams or 30 gr.; sulphuric acid, 10 c.c. or 3 dr.

**First Development.**—For one  $\frac{1}{2}$  plate use 1 oz. of developer with 4 oz. of water. For correct exposures develop for exactly  $2\frac{1}{2}$  minutes, temperature of bath being about 60°. Time of development is shortened for over-exposure and prolonged for under-exposure. For development of uncertain exposures, see below.

**Reversal.**—On removal from developer rinse in running water, then place in about 3 oz. of reversing bath and take into daylight. The plate will gradually become transparent and the colors will be visible on examination. At the end of 3 or 4 minutes, when the negative should be completely transparent, remove from bath and wash for about  $\frac{1}{2}$  minute in running water.

**Second Development.**—Re-develop in full daylight, using the solution which has served for the first development (kept in the dish without special precautions). When the high lights are completely darkened (about 3 or 4 minutes), wash for 3 or 4 minutes and place to dry. Fixing is unnecessary unless the plate is intensified.

**The Original Method, Improved.**—Some of the best workers still prefer this method (with the substitution of (aa) and (bb) for the (a) and (b) solutions given in our last volume) to the newer method with fewer operations. They claim that they secure more plucky, brilliant-colored autochromes. The solutions.

—First development: (aa). Bisulphite of soda solution, 2 drops; pyro, 45 gr.; potassium bromide, 45 gr.; water,  $3\frac{1}{2}$  oz. (bb) Anhydrous sodium sulphite, 3 dr.; ammonia,  $\frac{1}{2}$  oz.; water, 3 oz. Reversal of the image: (c) Water, 1,000 c.c. or 35 oz.; potassium permanganate, 2 grams or 30 gr.; sulphuric acid, 10 c.c. or 3 dr.

## Photography

### (Lumière Process)

Second development: (d) Distilled water, 1,000 c.c. or 35 oz.; anhydrous sulphite, 15 grams or  $\frac{1}{2}$  oz.; dianol, 5 grams or 75 gr. Oxidation: (e) Water, 1,000 c.c. or 35 oz.; solution (c), 20 c.c. or 5 dr. Intensification: (f) Water, 1,000 c.c. or 35 oz.; pyrogallie acid, 3 grams or 45 gr.; citric acid, 3 grams or 45 gr. (g) Distilled water, 100 c.c. or  $3\frac{1}{2}$  oz.; silver nitrate, 5 grams or 75 gr. Clearing: (h) Water, 1,000 c.c. or 35 oz.; potassium permanganate, 1 gram or 15 gr. Fixing: (i) Water, 1,000 c.c. or 35 oz.; hypo, 150 grams or  $5\frac{1}{4}$  oz.; saturated solution of soda bisulphite, 50 c.c. or  $1\frac{3}{4}$  oz. Varnishing: Crystallizable benzine, 100 c.c. or  $2\frac{1}{2}$  oz.; gum dammar, 20 grams or 308 gr.

**Tentative Development of Uncertain Exposures.**—The dark-room lamp should be fitted with the Lumière "Virida" light filter. Development of one plate ( $5 \times 7$ , or half plate): (1) Put in one measure glass 15 c.c. ( $\frac{1}{2}$  oz.) and in another 45 c.c. ( $1\frac{1}{2}$  oz.) of the concentrated developer (aa) and (bb) or quinomet (above). (2) Put in the developing dish: Water, 80 c.c. or  $2\frac{1}{2}$  oz.; concentrated developer, 5 c.c. or 85 minims, at a temperature of 60° F. Immerse the plate in this solution and count the number of seconds elapsing before the first outlines of the image appear, disregarding the sky. Immediately these outlines are discernible, pour into the dish either 15 c.c. ( $\frac{1}{2}$  oz.) or 45 c.c. ( $1\frac{1}{2}$  oz.), whichever may be necessary.

**Variation in Time of Development Due to Temperature.**—At 50° F. develop 4 min.; at 60° F. develop  $2\frac{1}{2}$  min.; at 68° F. develop 2 min.; at 77° F. develop  $1\frac{1}{2}$  min.

**Modifications in Autochrome Development.**—For known over-exposure.—Up to 4 times normal: Develop  $1\frac{1}{2}$  min. at 60° F. 4 to 8 times normal: (a), 20 c.c.; (b), 5 c.c.; water, 100 c.c.— $6\frac{1}{2}$  min. 8 to 15 times normal: (a), 20 c.c.; (b), 3 c.c.; water, 100 c.c.— $6\frac{1}{2}$  min. For known under-exposure— $\frac{1}{2}$  to  $\frac{1}{4}$  normal: (a) 10 c.c.; (b), 20 c.c.—6 min. Less than  $\frac{1}{4}$  normal: (a), 6 c.c.; (b), 20 c.c.—6 min.

**Flat, Under-exposed Autochromes.**—(a) Hypo,  $\frac{1}{2}$  oz.; water, 10 oz. (b) Potassium ferricyanide, 30 gr.; water, 10 oz. Dissolve and mix. Reduce the plate for 5 min. herein. Wash 2 min.; intensify with solutions (f) and (g) above. Treat with (h), and fix with (i).

**Stand Development.**—Lumière's (a) solution,  $\frac{5}{2}$  dr.; (b) solution,  $\frac{5}{2}$  dr.;

### (Ives' Tripak Process)

water, 50 oz. With under-exposed plates, develop for 1 hour.

**Acid-Amidol Developer.**—Sodium bisulphite lye, 20 minims; sodium sulphite (anhydrous, 15 gr.; potassium bromide (10% solution), 10 minims; diamidophenol (amidol), 5 gr.; water, 1 oz. Develops a correctly exposed plate in 20 min. at 60° F., and is recommended because the application of the developer immediately decreases the plate's sensitiveness to light, so that development may be watched in a deep green safe-light. A more energetic developer, with the same characteristics, is: Amidol, 5 gr.; potassium bromide (10%), 5 minims; sodium sulphite (anhydrous), 15 gr.; water, 1 oz.

**Developing Autochromes by Observation.**—Use Virida safe-light, and even from this screen the plate as much as possible; in fact, it should be protected from the light entirely until in the developer. Lay the plate quickly in the developer and count seconds at once, until the image is first seen, disregarding the sky; but as the image never appears, even with great over-exposure, till 22 sec. have passed, the dish may be covered for the first 22 sec. The solutions are: (aa) Water, 100 c.c.; bisulphite of soda lye, 3 drops; pyro, 3 grams; potassium bromide, 3 grams. (bb) Water, 85 c.c.; anhydrous sulphite, 10 grams; ammonia, .920, 15 c.c. For use dilute (bb) to quarter strength, i.e., water, 150 c.c.; solution (bb), 50 c.c. In what follows, "ammonia solution" means (bb) thus diluted to quarter strength.

**Development.**—For a half-plate put in a dish: Water, 80 c.c.; solution (aa), 10 c.c.; ammonia solution, 10 c.c.; and have in a small graduate 45 c.c. of ammonia solution to be added wholly or in part to the bath during development. Temperature, 60° F. If this cannot be adhered to, it remains to work out tables for other temperatures. The dish should be kept in shadow, and only brought near the light occasionally to judge the "time of appearance." When that is noted and the extra ammonia added if indicated, the dish may be kept covered until time is up.

**Ives' Tripak Color Photography and Formulas.**—The method consists in exposing a pack of 3 color sensitive gelatinobromide of silver plates in a special plate holder and camera, which are supplied by the manufacturer grouped together in such a way that they can be opened out for exposure in the camera through color compensating screens and be developed as a unit in a tank developer. The exposure

## Photography

### (Ives' Tripack Process)

in bright sunlight with F-8 stop in lens is 1 sec. Exposure with stop F-16 is 4 times longer. The preferred developer is glycine, as follows: Hot water, 80 oz.; sulphite of soda (dry), 3 oz.; glycine, 1 oz.; carbonate of potash,  $5\frac{1}{2}$  oz.; bromide of potassium, 60 gr. This solution is cooled to 60° F. before use. The developer keeps well and can be used over and over again for weeks. If the negatives appear too thin after many have been developed, they may be left in longer or a little fresh undiluted stock added, stirring well to obtain a perfect mixture. The plates in the pack are removed from the plate holder in the dark room and immersed in tank of developer at 70° F. for 8 min.; if temperature is 60° or cooler, development in the tank will require 12 min. Correct exposure will insure good negatives. After development the plates are washed in water, then fixed in a hypo sulphite soda bath of the usual proportions, 1 oz. of hypo to 6 oz. of water, then washed and dried.

Transparent prints on a specially prepared bichromate sensitized collodion fish glue film (sensitized with a bichromate of potash solution) are made from all of the 3 negatives at one time, and are fixed by washing in water for 3 min. The back side of the sensitized film is printed in contact with the glass negative in a printing frame, in sunlight if possible, until a piece of solio paper matches tint, say No. 7 in the tripack exposure meter. The exposed sheet is then removed from the frame, laid on and clamped to a sheet of glass, and washed under a stream of water as previously mentioned. After development the plate and film attached is immersed for 2 min. in a chromic acid bath (30 gr. to 16 oz. of water), after which it is drained and hung up to dry. When quite dry the images are removed from the glass support and cut apart and immersed (still face up) in 3 respective dye baths; the print from the (r) negative in the peacock blue, that from the (c) negative in magenta, and that from (b) negative in the yellow. The coloring is usually completed in 5 min., but the film may be left in longer without affecting the result. After coloring, the films are dipped one at a time in clear water to remove the surplus dye. They may then be pressed between blotting paper to remove most of the water and hung up to dry. When quite dry any fluff adhering from the blotting paper may be removed by means of a chamolais leather. The magenta film may be dipped in a solution of hydrogen peroxide instead of plain water before

### (Photo-Mechanical)

blotting off. It fixes the action of the dye better on the film. When absolutely dry the prints may be superposed in register on a glass and bound together between 2 glasses like a lantern slide. The peacock blue film should be laid on the glass first and clamped at one end with a wide steel spring; then the crimson film laid upon this and shifted until each detail exactly corresponds with the blue, then held with the fingers till the clamp can hold both in position. Then the yellow print is superposed and registered and clamped in the same way. Thus completed, the result is a picture in the colors of nature when viewed by transmitted light. The various supplies are furnished by the Ives' Inventions Co. of New York.

*Two-color Heliochromy.*—Some marvelously effective color-prints and transparencies can be made from 2 exposures. Make 2 negatives through blue and orange light-filters respectively. From the orange-filter negative make a ferro-prussiate print or transparency. From the blue-filter negative print in orange (e.g. by gum bichromate coated over the blue print). For stereoscopic effect, 1 blue print and 1 silver print toned to an orange will give good results, with no need for superposition. The compound color effect can be seen in the stereoscope, even if the negatives have not been made stereoscopically; but in this case there will not be stereoscopic relief.

### PHOTO-MECHANICAL OPERATING (MONOCHROME AND THREE-COLOR)

#### Tri-Color Light-Filters.

*Red Filter, Blue Printer.*—Dye solutions: Rose Bengal, 4 gr.; flavazine, 20 gr.; 10% gelatine solution, 9 oz. The gelatine is Crenetz's middle hard. Soak a quantity in a small measured quantity of water, dissolve by heat, and add water to make 10 times the quantity of the original gelatine.

*Green Filter, Red Printer.*—Rapid filter green, 1 gr.; naphthol green, 2 gr.; flavazine, 3 gr.; 10% gelatine, 9 oz. Proceed as above.

*Blue Filter, Yellow Printer.*—Dye solutions: Victoria blue B, 5 gr.; naphthol green, 2 gr.; 10% gelatine, 9 oz. Proceed as above.

*Yellow Filter, Black Printer.*—Dye solution: Tartrazine (1 to 100), 1 oz. 400 minims. Proceed exactly as above.

#### Light Filters.

*Yellow Screens.*—Stock Solution: Rapid filter yellow (k), 2 gr.; distilled



## Photography

### (Photo-Mechanical)

water, 365 minims. No. 1 Filter: 6% gelatine solution, 120 parts; stock dye solution, 3 parts; water, 21 parts. No. 2 Filter: 6% gelatine solution, 120 parts; stock dye solution, 6 parts; water, 18 parts. No. 3 Filter: 6% gelatine solution, 120 parts; stock dye solution, 12 parts; water, 12 parts. No. 4 Filter: 6% gelatine solution, 120 parts; stock dye solution, 24 parts. Coat 118 minims (7 c.c.) on every 16 sq. in. (100 sq. c.c.) of glass. Cement 2 filters together. The increase of exposure for these filters is  $1\frac{1}{4}$ :1.7:2.3 times for erythrosine or pinachrome bathed plates.

**Three-Color Filters (for subtractive methods).—**Stock gelatine solution: A 6% solution. The Violet Filter (yellow printing negative).—Stock dye solution: Crystal violet, 31 gr.; warm water, 6 oz. 75 minims; glacial acetic acid, 3 drops. To make the filter, add 20 parts of dye solution to 100 parts gelatine solution, filter. Or, 2 stock dye solution: Rapid filter blue,  $15\frac{1}{4}$  gr.; water, 6 oz. 160 minims; ammonia, 10 drops. Filter: Gelatine solution, 100 parts; dye solution, 20 parts. No. 2 is more staple to light than No. 1. Green Filter (red printing negative).—Stock dye solution: Rapid filter green (i), 62 gr.; water,  $3\frac{1}{2}$  oz. Filter: Gelatine solution, 100 parts; dye solution, 20 parts. This transmits the extreme red; the following does not, and should always be used with panchromatic plates. Stock dye solution: Filter blue-green,  $15\frac{1}{4}$  gr.; filter yellow (k),  $15\frac{1}{4}$  gr.; water,  $3\frac{1}{2}$  oz. Filter: Gelatine solution, 100 parts; dye solution, 20 parts. Red Filter (blue printing negative).—Stock dye solution: Rapid filter red (i),  $38\frac{1}{2}$  gr.; water,  $3\frac{1}{2}$  oz. Filter: Gelatine solution, 100 parts; dye solution, 20 parts. Cement 2 glasses of each color together. Relative exposures for pinachrome or pinacyanol bathed plates: 4:8:12:8:12.

**Additive Filters (for negatives for chromoscope or projection).—**Violet Filter.—Stock dye solution: Crystal violet, 23 gr.; methylene blue,  $7\frac{3}{4}$  gr.; water, 4 oz. 192 minims; glacial acetic acid, 3 drops. Filter: Gelatine solution, 100 parts; dye solution, 20 parts. Green Filter.—Stock dye solution: Rapid filter green (ii),  $61\frac{3}{4}$  gr.; water,  $4\frac{1}{4}$  oz. Filter: Gelatine solution, 100 parts; dye solution, 20 parts. This transmits the extreme red; the following does not. Stock dye solution: Filter blue-green, 11 gr.; filter yellow (k),  $19\frac{1}{4}$  gr.; water,  $3\frac{1}{2}$  oz. Filter: Gelatine solution, 100 parts; dye solution, 20 parts. Red Filter.

### (Photo-Engraving)

—Stock dye solution: Filter rapid red (ii),  $38\frac{1}{2}$  gr.; water,  $3\frac{1}{2}$  oz. Filter: Gelatine solution, 100 parts; dye solution, 20 parts. Allow 118 minims of dyed gelatine to every 16 sq. in. Cement 2 screens of the same color together. Ratio of exposures for pinachrome or pinacyanol bathed plates—4:12:12.

#### Developers.

**Developers for Photo-Mechanical Dry Plates.—Pyro-Ammonia.**—(a) Pyro, 30 gr.; ammonium bromide, 30 gr.; potassium metabisulphite, 30 gr.; distilled water to 10 oz. (b) Ammonia (.880), 70 minims; distilled water to 10 oz. Equal parts.

**Pyro-Soda.**—(a) Pyro, 1 oz.; water, 86 oz.; pure nitric acid, 20 drops; potassium bromide, 120 gr. (b) Soda sulphite, 9 oz.; soda carbonate (crystals), 10 oz.; water, 86 oz. Equal parts (a) and (b).

**Hydroquinone.**—(a) Hydroquinone,  $\frac{1}{2}$  oz.; potassium metabisulphite,  $\frac{1}{2}$  oz.; potassium bromide,  $\frac{1}{2}$  oz.; water, 20 oz. (b) Caustic potash, 1 oz.; water, 20 oz. To use. Shake bottles well. Take equal parts (a) and (b), develop 2 min., wash thoroughly before fixing.

**Metol-Hydroquinone.**—(a) Metol, 40 gr.; hydroquinone, 50 gr.; sulphite of soda, 120 gr.; bromide of potassium, 30 gr.; water, 20 oz. (b) Caustic potash, 180 gr.; water, 20 oz.

**Fixing Bath for Dry Plates.**—Hypo, 16 oz.; potassium metabisulphite, 1 oz.; water, 40 oz.

**Drying.**—To enable dry plates to be dried over gas, fix in: (a) Hypo, 48 oz.; water, 96 oz. (b) Sulphuric acid,  $\frac{1}{4}$  oz.; crystallized sulphite soda, 4 oz.; chrome alum, 2 oz.; water, 32 oz. Add (b) to (a) very gradually.

**Reducer.**—(a) Hypo, 1 oz.; water, 4 oz. (b) Potassium ferricyanide, 50 gr.; water, 14 oz. Wash negative, and just cover with (a) for 2 min. Pour off (a) solution, add a few drops of (b), and return to dish. If too slow, pour off again and add more (b).

**Intensifier.**—Bleach with mercury and blacken with ammonia or other suitable alkali.

#### Miscellaneous Photo-Engraving Formulas.

**Passing or Removing Bath for Zinc.**—Alum, 2 oz.; nitric acid,  $1\frac{1}{2}$  oz.; water, 80 oz.

**Passing Bath for Copper.**—A weak solution of iron perchloride, for about 1 min. Wash well, and bathe with ammonia (.880), 1 part; water, 10 parts, until

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### (Photo-Engraving)

oxide is removed. Or, Chromic acid, 1 oz.; water, 40 oz.

**Fish Glue. To Clarify.**—Use a specially clarified glue when possible. In an emergency, take ordinary fish glue (preferably a non-acid sample) and clarify by mixing fish glue, water, and white of egg in equal quantities, beating well, to mix thoroughly. Heat in a jacketed pan, stirring all the time, until boiling-point is reached; then boil for 1 min., until the albumen has coagulated, which it will do around the suspended matter in the glue. Filter through a couple of thicknesses of fine muslin.

**Fish Glue, To Preserve.**—Fish glue that is really fit for process work is efficiently treated with preservative for ordinary conditions. With very small or irregular amount of work, entailing the keeping of part of a supply of fish glue in a part-empty bottle for a long time, there is risk of deterioration. In such cases, decant from the stock bottle into several smaller bottles, properly corked. Use from one at a time. Fish glue keeps much better before than after dilution.

**Albumen for Line Work on Zinc.**—White of 1 egg (or 70 gr. of dried albumen in 1 oz. of distilled water); ammonium bichromate, 130 gr.; water, 20 oz. Addition of 144 minims fish glue makes the print develop more easily.—*Bolt Court.*

**Fish Glue for Line Work on Zinc.**—Fish Glue, 5 oz.; water, 100 oz.; ammonium bichromate,  $\frac{1}{4}$  oz.; ammonia added drop by drop until solution changes to bright yellow. Gets slower with keeping.

**Bitumen Process for Line Work on Zinc.**—Dissolve 150 gr. of finest powdered Syrian asphaltum in 2 oz. of chloroform and 3 oz. of anhydrous benzole. Add 30 gr. of Venice turpentine and 10 drops of oil of lemon or oil of lavender. Film should be a transparent golden tint. Develop with rectified turpentine.

**Fish-Glue Enamel: The Original Formula.**—Fish glue, 2 oz.; eggs (whites), 2 oz.; water, 4 oz.; ammonium bichromate, 120 gr.

**Fish-Glue Enamel.**—Fish glue (Le Page's photo-mechanical) 5 oz.; water, 6 oz.; ammonium bichromate (saturated solution), 3 oz. Mix, stand for 3 or 4 hours, and filter before use.

**Fish-Glue-Albumen Enamel.**—Fish glue (Le Page's), 3 oz.; water, 8 oz.; ammonium bichromate, 180 gr.; white of 2 eggs. Beat egg whites for 5 min.; add to glue solution; beat again with egg whisk; stand for 8 or 10 hours. Filter.

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**Tschörner's Tested Formulae.**—The result of a long series of tests in the Imperial Technical Institute, Vienna, gives the following as the best formulae and proportions. For daylight printing: Clarified fish glue, 30 c.c.; ammonium bichromate (10% solution), 35 c.c.; albumen (dried), 4 gr.; water, 65 c.c. For printing by arc and mercury-vapor lamps: Clarified fish glue, 30 c.c.; ammonium bichromate (10% solution), 20 c.c.; albumen (dried), 4 gr.; water, 80 c.c.

**Hardening Bath for Enamel on Zinc.**—Use as for copper and dye with violet. After thorough washing place for 3 min. in ammonium bichromate, 2 oz.; chromic acid,  $\frac{1}{2}$  oz.; methylated alcohol, 5 oz.; water, 50 oz. Wash dry, and burn in.

**Gold Enamel on Zinc.**—Print as usual in fish glue, burn in only until the color of the dye is discharged, and etch with alcohol, 40 oz.; water, 60 oz.; nitric acid, 1 to 2 oz.

**Cold Enamel for Newspaper Work** and to stand the most forceful machine etching. A coating that overcomes the various disadvantages of previous "cold" enamels. (a) Place 5 parts of raw rubber in a bottle that will hold 100 parts, and add tar oil, 20 parts, and soak for 24 hours. Shred  $2\frac{1}{2}$  grams of gutta percha into a porcelain tray and heat on sand bath until melting begins. Stir in a small quantity of carbon bisulphide, and pour this off into the bottle containing rubber and oil; repeat with a little more bisulphide until about 65 grams have been used, and all the gutta percha has been dissolved. Cork the bottle very well, and let it stand a few days until it contains a homogeneous thick syrup. Will keep indefinitely if well corked. Vapor must be kept from fire or open flame. (b) Bitumen, 40 parts; chloroform, 60 parts. Dissolve and filter through cotton wool. To use take: Bitumen solution, 100 parts; rubber syrup, 5 parts; mix; filter well. Flow a little on a piece of glass, and if film is too thick, add a little chloroform. To coat the metal see that it is cold; flow with the mixture, and run to the corners as in varnishing a negative. Dry. Rub all over with a thick solution of gum arabic on a little cotton wool; wash well; coat with a thin coating of sensitized fish glue. Whirl with as little heat as possible, drying the fish-glue coating slowly. If much heat is used the film will reticulate and crack. In printing, have the negative cold or only slightly warm. Give a strong exposure to sunlight or powerful electric arcs; develop in cold water; dry. Coat with enough of:

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### (Photo-Engraving)

Turpentine, 3 parts; benzine, 2 parts, to just cover; let it stand 5 sec. on the plate; wash quickly under the tap; pass with sponge and gum-arabic solution, and rub with cotton wool to wash away any fish glue remaining. Dry. Etch.

**Dry Enamel Process.**—Ammonium bichromate, 125 gr.; sugar candy, 270 gr.; chromic acid, 80 gr.; albumen, whites of 2 eggs; liquor ammonia, 120 drops; water, 10 oz. After printing, dust with finely powdered anhydrous carbonate of soda, or carbonate of magnesia, with a soft brush, brushing until the image is clear. Use small dark room or cupboard for the dusting, and keep atmosphere moist by having a bowl of hot water standing on the floor. Or, Grape sugar, 180 gr.; water, 8 oz.; ammonium bichromate, 150 gr.; chromic acid (10% solution), 35 minims.—*Tschörner*.

**Stopping-out Varnish.**—Best pale shellac, 8 oz.; methylated alcohol, 20 oz.; methyl violet, 2 dr.; oil of lavender, 1 dr. Or, Methylated alcohol, 20 oz.; shellac, 6 oz.; dragon's blood, 3 oz.; oil of lavender,  $\frac{1}{2}$  oz.; lampblack, 1 oz. Dissolve the shellac, add the other ingredients as given. Or, Best litho ink, 4 oz.; beeswax, 2 oz.; rosin, 2 oz.; bitumen,  $\frac{1}{4}$  oz.; well mixed, with turpentine to make it workable.

**Rolling Up with Ink.**—Gum up the plate as for line work, and ink up with a glazed roller, and starting ink thinned down with machine oil or thin varnish. Dust with bitumen, and burn in.

**Etch for Copper Half-Tones.**—Iron perchloride, 1 lb.; water, 14 oz.; or test by Beaumé hydrometer to from 40 to 45°. Improved by adding 1 part of old, used bath to 4 parts of new. For fine etching, dilute to 35° Beaumé. The best strength is 35° Beaumé, if the solution is changed frequently, and not used for too long.

**Quick Etching for Copper.**—Heat the solution to 100° F. and insert the plate face downward; or, if depth is not required, place face upwards, rock the bath, and brush face of plate occasionally.

**Deep Etching Copper Half-Tones.**—Stop out with strong stopping-out varnish, or roll up as for line zinc. Add a little hydrochloric acid to the perchloride solution, or the etching may be done with nitrous acid. Use a brush freely on the bare parts. Penrose's glass etching brush is good. Rock the bath; heat to about 100° F.

**Etching Enamel on Zinc.**—Before placing the plate in the etch, roll it up all over with the thinnest possible film of good letterpress proofing ink, which will

### (Photo-Engraving)

help to prevent the enamel leaving the zinc.

**Etch for Half-Tone on Zinc.**—First bite: Water, 100 oz.; nitric acid, 1 oz. Deep etch: Water, 100 oz.; nitric acid, 10 oz. Fine etch: Water, 100 oz.; nitric acid,  $7\frac{1}{2}$  oz.

**Deep Etch for Zinc (dragon's blood process).**—First bite: Water, 100 oz.; nitric acid, 5 oz. Second bite: First bath, strengthened further for further bites if necessary. Or, First bite: Nitric acid, 4 oz.; water, 80 oz.; powdered alum, 3 oz.; 5 to 6 min. Roll up, rinse and replace in same bath to which 4 oz. more acid has been added; 5 min. To finish, remove the rolling-up ink; paint out the solid blacks; and place in nitric acid, 3 oz.; water, 60 oz.; alum, 1 oz.; 3 to 4 min.

**"Still" Etching for Zinc.**—Sulphuric acid, 6 oz.; potassium nitrate, 2 oz.; water, 20 oz. Dissolve the nitrate; add the acid slowly, then dilute gradually with water until there is no more bubbling.

**Viscous Acid Bath.**—The addition of fish glue, gum arabic, brown sugar, or similar thickening matter to the nitric acid etching bath is recommended by some very good etchers as helping to give a smooth edge to the etched line. Some add alum (1% or less) to the bath.

**Levy Etching for Zinc.**—Usually nitric acid, 1 part; water, 6 parts; may be increased to nitric acid, 1 part, water, 3 parts. First bite, 30 to 40 sec.  $\frac{1}{2}$  lb. air pressure; second bite, 60 to 90 sec., 1 lb. air; third bite, 4 to 5 min.,  $1\frac{1}{2}$  lb. air.

**Acid-Blast Etching for Zinc.**—Nitric acid, 1 part; water, 7 parts. First bite, 20 seconds; second bite, 45 to 60 seconds; third bite, 2 to 4 minutes. After the third bite give a heavy four-way powdering, and etch out the whites to avoid much routing.

**Etch Powdering.**—To protect the "shoulder" of the lines in deep etching. Brush dragon's blood against one side of lines with a "badger softener." Heat plate until powder is fused. Thoroughly cool, and repeat operation for remaining three sides of lines, so that the level zinc is left bare, but the powder piled against all sides of the elevations. Heat only until the powder just melts.

**Rolling-up Process for Zinc.**—First, etch, roll up with best black litho ink, thinned with middle litho varnish; second, third, and other etchings, roll up with "starting" ink (see later) thinned with middle litho varnish. Finishing etch, clean off all ink, and reink with hard

## Photography

### (Photo-Engraving)

etching ("finishing") ink, applied with a glazed roller.

**Soft Etching Ink.**—Beeswax, 3 oz.; talow, 3 oz.; asphalt, 1 oz.; good litho ink, 8 oz.; litho varnish (thin), 8 oz. Melt first 4 ingredients, and mix well; add litho varnish, allow to cool, and work well with a muller on an ink slab.

**Starting Ink for Line Work.**—Good letterpress ink, 1 lb.; beeswax, 1 lb.; thin litho varnish, 4 oz. Melt, mix and mull thoroughly.

**Hard Etching Ink.**—Good litho printing ink, 8 oz.; beeswax, 2 oz.; shoemaker's wax, 6 oz.; rosin, 6 oz. Melt, and mix thoroughly.

**Black Wax.**—Asphaltum, 2 oz.; white wax, 5 oz.; stearic acid, 5 oz.; spermaceti, 10 oz. Melt, and mix thoroughly. Or, Beeswax, rosin and tar, in equal quantities, melted, and thoroughly mixed.

**Rolling-up Ink.**—Letterpress ink, 1 lb.; bitumen, 4 oz.; rosin, 3 oz.; beeswax, 3 oz.; turpentine, 10 oz.

**Rolling Up.**—Heat the plate on a hot bed, and roll up with glazed roller, examining with a magnifier until all the top is well covered and each dot just shows a yellow rim around it. If too heavily inked, or too greatly heated, the ink will cover the hollows that should be etched.

**Clearing Solution for Copper.**—Chromic acid, 1 dr.; water, 20 oz.; sulphuric acid, 1 dr. May also be used to clean up plate after etching. After using it, the plate should be passed through weak nitric acid solution. Or, Hydrochloric acid, 2 oz.; common salt, 4 oz.; water, 20 oz.

**Removing Enamel from Plates.**—Hot saturated solution of crude American potash is generally used, brushing with a stiff brush. A solution of 1 lb. of potash to 1½ gal. of water is said to be effective. Caustic soda will do as well. If the plate is stained and dirty, it can be brightened with the clearing solutions given above, or a rock or two in nitric acid bath.

**Removing Ink or Varnish from Plate.**—Wash the plate well with turps and methylated spirit together; then with methylated spirit alone. Immerse in water, 10 oz.; chromic acid, ¼ oz.; hydrochloric acid, 3 oz.; methylated spirit, 3 oz. Stand for a few minutes before use. Immerse the plate for a few seconds, and with an etching mop or cotton wool free it from scum or deposit.

**Ink.**—(a) Litho writing ink, 4 sticks; Burgundy pitch, 8 oz.; benzole, 10 oz.; let stand for 2 days. (b) Ground bitumen, 16 oz.; turpentine, 40 oz. Mix (b) and add to (a); then add 1 lb. of Winsor's black zinc ink; then add 2 oz. of

### (Photo-Engraving)

Lucca oil (in winter, but less in summer). To ink plate, take 1 part of above to about 5 parts of turpentine, rub well in with wad of flannel, and roll even with dry composition roller. Allow plate to stand, if possible, under ink for 12 hours, then develop, as above.

**Succell'd Gelatine Line Process.**—The films.—Nelson's amber gelatine, 4 oz.; swell for some hours in 15 oz. of water, then melt in jacketed pan, and add sugar, 1 oz.; chrome alum (saturated solution), 10 drops. Stir well, strain, and coat on plates, which already have been coated with plain enamel collodion, and dried. Use 1 oz. of gelatine solution for every 40 sq. in. of glass. Dry, and store. To sensitize: Ammonium bichromate, 1 oz.; methylated alcohol, 5 oz.; water, 15 oz. Immerse 3 minutes; dry in dark room. Print under negative until image shows through glass. Soak in cold water for 2 to 4 hours. Dab dry with soft rag, level on bench, and surround with a wall of paper an inch deep to hold the plaster. Casting: Mix fine plaster of paris with water, to be as stiff as can be poured freely, pour over the film to about ½ in. deep, feeling all over with fingers or a brush to break air bells. Allow to set, dry thoroughly, and strip plaster from gelatine relief. Molding: Set the dry cast level in porcelain tray, and pour water around (not over) it, leaving it until the face is evenly moist. Then remove from water, renew paper wall, and pour melted beeswax and fine black lead over the cast. When set, strip, level, build up the large whites with more wax, using a molding tool, hot, and electrotype.

**For High Reliefs.**—Soak 2½ oz. of soft (Nelson's amber) gelatine in 10 oz. of water. Dissolve, and add 150 gr. of potassium bichromate. Coat at rate of 6 oz. to 12 x 10 plate.

**Succell'd Gelatine (Woodbury's).**—Nelson's sheet gelatine, 4 oz.; sugar, ¼ oz.; glycerine, 100 gr.; phenol, 2 minims; Indian ink, 2 gr.; potassium bichromate, 200 gr.; water, 1½ oz.

**Chalk Plates.**—Dissolve pure gum arabic in warm water to consistency of cream. To every teaspoonful of precipitated chalk add 1 teaspoonful of gum arabic solution. Add water, and stir until the whole becomes a thin emulsion. Remove rust from the base plates with emery paper. Blue these plates on a hot fire, and while still warm pour on the chalk emulsion. Bake slowly in an oven until the water is all evaporated. The upper crust will crack, and can be peeled

## Photography

### (Collotype)

off, when the chalk surface can be scraped smooth. If coating too hard, too little chalk; if too soft, too little gum.

#### Collotype: Photo-Lithography and Kindred Processes.

*Collotype; the Basis.*—Usually plate glass; may be metal, preferably zinc,  $\frac{1}{4}$  in. thick; or gelatinized paper for small runs.

*Graining Bath for Zinc.*—Nitric acid,  $\frac{1}{2}$  oz.; alum (saturated solution),  $7\frac{1}{2}$  oz.; water to make 50 oz. Rock until zinc is evenly silver gray; wash; remove scum with cotton wool.

*Copper Basis.*—Grain with a glass muller and fine emery powder.

*Aluminum Basis.*—Grain with sulphuric acid, 1 oz.; water, 30 oz.

*Glass Basis.*—Should be absolutely level plate, and finely ground. If not, prepare with glass muller and fine emery in water. Or grind 2 plates face to face.

*Substratum.*—Silicate of potash, 1 oz.; cold beer (four-ale), 10 oz.; tannic acid,  $\frac{1}{2}$  gr.; add silicate to beer; filter; flow over plate, avoiding air bubbles; dry spontaneously. When dry, if a white scum shows on surface, rinse with distilled water. Should no scum be seen, rub plate well with a wad of papier Josef, when it will be ready for coating. Or, Albumen of fresh eggs, 16 oz.; potassium silicate, 7 oz.; water, 20 oz.

*Sensitized Gelatine Solution.*—Middle hard gelatine, 2 oz.; bichromate of potash,  $\frac{1}{4}$  oz.; distilled water, 20 oz. Soak gelatine in 20 oz. of distilled water. After thoroughly saturated, pour remaining water off into measure, and note quantity. Throw this away. Replace same quantity, add to gelatine, and dissolve on water bath, not above  $120^{\circ}$  F. When thoroughly dissolved, add the bichromate (powdered), gradually stirring all the while. Cook for  $\frac{1}{4}$  hour, add 10 to 20 drops of ammonia (.880); filter through jacketed warm-water funnel. Coat about 10 dr. to 1 sq. ft. of glass.

*"Etch" or Dampening Solution.*—Solutions of sugar, gum, glycerine, etc., to keep the plate evenly moist, and repellent of greasy ink. Possible varieties are endless. Types are: Glycerine, 30 oz.; water, 20 oz.; common salt, 50 gr. Or, 2 oz. of ammonia (.880) in place of the salt. Or, Glycerine, 30 oz.; water, 20 oz.; salt, 1 oz.; hypo,  $\frac{1}{2}$  oz.; oxgall,  $\frac{1}{4}$  oz.; ammonia (.880), 2 oz.

*To Recover a Flat-working Plate.*—When high lights print muddy, wash out the ink with turps, dab the plate surface dry, wash over quickly with glycerine, 5

### (Collotype)

oz.; potassium cyanide, 10 gr.; water, 20 oz. Wash off immediately with a sponge saturated with water. This may make the plate refuse all ink, in which case let it dry, "etch" as usual, for half an hour, and ink up.

*The Artotype Method.*—Support, glass. Substratum: (a) Albumen (fresh egg), 150 grams; ammonia (.80), a few drops. (b) Potassium bichromate, 3 grams; water, enough to just dissolve the bichromate. Ammonia (.880), added drop by drop, until color changes to bright yellow. Beat (a) to a light froth; let stand; add (b). Sensitive coating: Soft gelatine, 160 grams; ammonium bichromate, 30 grams; water, 2,400 c.c. Coat plate, and dry at  $110^{\circ}$  F. for 10 minutes. Second sensitive solution: When first is thoroughly dry: (a) Gelatine, 75 grams; water, 1,000 c.c. (b) Isinglass, 75 grams; water, 1,000 c.c.; potassium bichromate, 18 grams. (c) Chrome alum, 10 grams; potassium bichromate, 2 grams; water, 200 c.c. Take 50 grams of (a), 50 grams of (b) and 2 grams of (c). Dry in oven, at  $110^{\circ}$  F., for 12 minutes, and complete the drying slowly.

*Gelatino-Bromide Collotype.*—Coat plate glass with gelatino-bromide emulsion; expose behind a negative. Develop with sodium carbonate, 20 gr.; water, 1 oz.; pyrogallol acid, 1 gr. Fix, wash, and brush over with calcium nitrate, 1 oz.; water, 2 oz. Stand for  $\frac{1}{2}$  hour; wipe off superfluous moisture, ink up, and print. Etch with the calcium nitrate solution.

*Dry-Plate Collotype.*—Soak a ground-glass transparency plate in potassium bichromate, 1 oz.; water, 20 oz.; ammonia, 100 minims. Dry. Expose under a negative, and also through the glass. Varnish in a wide strip around the edges with shellac varnish or wax, to prevent frilling. Wash up for 15 minutes, and it is ready to print. "Etch" if necessary.

*Collotype from an Ordinary Negative.*—An ordinary negative, not developed with pyro. or treated with any hardening agent, is immersed in: (a) Ferric chloride, 60 gr.; water,  $\frac{1}{2}$  oz. (b) Tartaric acid, 20 gr.; water,  $\frac{1}{2}$  oz. Dissolve separately, and filter; then mix, and dilute to 4 oz. with water. In this the negative bleaches, a superficial bleaching being sufficient. Wash until free from all yellowness, and dry. "Etch" with glycerine, ammonia and water in the usual way, and ink up. To prevent the plate breaking during printing, support it on a gelatine slab. Gelatine, 2 oz.; glycerine, 2 oz.; glucose, 2 oz.; water, 5 oz. Swell the gelatine, melt in a jacketed pan, add

## Photography

(Photo-Litho. Work)

other ingredients, and run into a shallow tin to set.

**The Pretsch Swelled Gelatine Process.**—(a) Coignet's gold medal gelatine, 1 oz.; water, 6 oz.; swell and dissolve the gelatine with gentle heat. (b) Silver nitrate, 30 gr.; water,  $\frac{1}{2}$  oz. (c) Potassium bichromate (saturated solution), 2 oz. To 1 oz. of (a) add (b). To the remainder of (a) add (c); and, while still warm, add the mixture of (a) and (b) to the mixture of (a) and (c). Mix thoroughly; then add calcium chloride (cryst.), 100 gr.; glycerine, 50 gr. Filter. Coat the glass, dry in dark; expose, wash until the whole plate appears granular, then ink up and transfer to litho plate or stone; or to metal plate, and etch for type printing. The strength of grain depends upon amount of calcium chloride.

**Photo-Litho Transfer Paper.**—Float good hard-sized wove (not laid) paper on Nelson's amber gelatine, 3 oz.; sugar,  $\frac{1}{4}$  oz.; water, 40 oz. Swell, dissolve, and add solution of chrome alum, 4 gr., in 1 dr. of water. Float several times, until the gelatine sets on the paper, then hang to dry; and float again in similar manner. Albuminize and sensitize by floating on whites of 20 eggs; water, 20 oz.; ammonium bichromate (saturated solution), 10 oz. Or, Bermuda arrowroot, 4 oz.; potassium bichromate,  $1\frac{1}{2}$  oz.; water, 60 oz. Dry in cupboard at 70 to 80° F. Printing 1 hour in direct sunlight, or 2½ hours to 2 enclosed arc lamps. Develop with benzole, 8 parts; French turpentine, 50 parts; aniline oil, 1 part; and a large tuft of cotton wool. Use turpentine and this developer alternately. Wash, dry with chamois leather, and use methylated alcohol to remove all traces of turpentine.

**Transfer Paper.**—(a) Glue,  $\frac{1}{4}$  oz.; swell and dissolve with heat, in 10 oz. of water. With this rub down 3 oz. of flour, and heat gradually until it boils, and "blims" to a thick paste. (b) Plaster of paris, 4 oz.; water, to just cover. Rub down with a spoon until the plaster thickens; add a little more water, and rub down until it thickens again. Continue adding, and rubbing or stirring, until the plaster thickens or sets no more; then mix well with the flour paste. Coat good printing paper, brushing with a broad brush, first one way, then across. Hang to dry. Or, Corn flour, 2 oz.; glycerine, 2 oz.; water, 10 oz.

**Sensitizing Solution.**—For winter: Potassium bichromate, 7 oz.; water, 160 oz.; ammonia (.880), added very slowly until

(Photo-Litho. Work)

solution turns lemon yellow. For summer: Potassium bichromate, 4 oz.; manganese oxysulphate,  $\frac{1}{2}$  oz.; water, 16 oz. Float, face upward, 4 to 5 minutes on solution, which must be about 64 to 65° F.

**Transferring on Hand Platen Press.**—Lay the zinc on the bedplate, damp the transfer in the usual way, and after laying down on the zinc, put several sheets of blotting paper on as backing. Pull with good pressure several times, remove backing, and damp the transfer again, turn the plate around, replace the backing, and put through the press again. Repeat these operations about 4 times. Then remove the transfer paper with hot water.

**Transferring to Zinc on Litho Press.**—To avoid cutting or marking the tympan, cut out an opening the size of the zinc plate (and as near its thickness as possible) in a sheet of strawboard the size of the stone, and place the plate in the opening, or place pieces of millboard at top and bottom of the plate. The scraper should be covered with a strip of leather. A piece of good, pliable and nicely seasoned leather between the tympan and the plate is also an advantage. Put 2 or 3 sheets of paper between the stone and the zinc plate.

**Rolling-up Ink.**—For albumen process prints: Good black litho ink, 8 oz.; palm oil, 1 oz.; Burgundy pitch, 2 oz.; beeswax, 2 oz.; middle varnish, 2 oz.; oil of lavender,  $\frac{1}{4}$  oz. For photo-litho transfers, thin down with turpentine.

**Litho Zinc or Aluminum Etching Fluid.**—Boil in 50 oz. of water 3 oz. 100 gr. of powdered nutgalls, and let it evaporate till 35 oz. remain; then filter 2 or 3 times through fine linen. When cool, add 400 gr. gum arabic, previously dissolved in least possible quantity of water. Well mix the whole, then add nitric acid, 150 gr.; hydrochloric acid, 230 gr.; phosphoric acid, 150 gr.

**Aluminum Plates.**—"Preparation" for transfer: Gum arabic solution (10° Beaumé), 1,000 c.c.; phosphoric acid syrup (45° Beaumé), 30 c.c. For originals in pen and pencil work reduce the phosphoric acid to 15 c.c.

**Aluminum Plates, Graining.**—New plates, 90 minutes; old plates, 45 minutes, in a graining machine making 180 turns per minute. Grain 00 for finest transfers, wood balls and very fine pumice powder. Grain 0 for ordinary transfers, wood balls, and coarse pumice. Only these 2 grains are used for transfers. Grain 1, glass balls and silic passed through No. 80 sieve. Grain 2, glass balls and silic

## Photography

### (Photogravure)

through 70 sieve. Grain 3, glass balls and silex through 60 sieve. These grains are for crayon and poster work.

**Aluminum, Gumming and Inking, as for Stone.** If there is any difficulty with transfer, gum the plate again. Dry. Place in essence of rectified terebenthin, 800 c.c.; rectified benzine, 200 c.c.; bitumen, powdered, 100 grams; copal litho writing ink,  $\frac{1}{2}$  stick. Treat with powdered rosin and talc, as for stone, and prepare as usual. To de-prepare any part, ink the plate thoroughly; rosin and talc it; then treat with oxalic acid (saturated solution), 40 c.c.; nitric acid, 40 c.c.; distilled water to 1,000 c.c. Erasure of old work. Clean with petroleum or essence of terebenthin and fine pumice powder, followed by benzine; finish with polishing felt, and nitric acid, 60 c.c.; hydrofluosilicic acid, 100 c.c.; water to 1,000 c.c., and wash well.

### Photogravure; Photo-Aquatint.

**Tissue Resist.**—Special carbon tissue is sensitized with bichromate of potash, 1 oz.; ammonia (.880), 5 drops; water, 20 oz. Filter after complete solution.

**Tarnish Remover.**—Acetic acid, 2 oz.; common salt, 2 oz.; water, 20 oz. Flow over the copper plate before laying down the tissue.

**Gelatine Coating to Prevent "Devils."**—Nelson's No. 1 gelatine, 120 gr.; bichromate of potash, 6 gr.; water, 9 oz. Filter carefully, and apply warm to the warmed copper plate. Dry, and expose to sunlight until insoluble. Recoat, draining from the opposite corner to the one previously drained, and again expose to sunlight. The printed carbon resist is transferred to plates thus prepared.

**Dust Ground.**—Finely powdered rosin, or gum copal, is used by the principal trade workers in France. Fine asphaltum powder is recommended by both Thomas Huson and Herbert Denison.

**Liquid Ground.**—Asphaltum, common rosin, and certain other gums, are applied (in solution in benzole or ether) by means of a scent spray or an air brush. Except where discriminating grain is needed, these seem to have no advantage over the dust ground.

**Reticulated Ground.**—Rosin, in pure, water-free alcohol, saturated solution (a few days to dissolve, with frequent shaking). For use, alcohol, 2 oz.; rosin solution,  $\frac{1}{2}$  oz. Flow over leveled plate, and allow to dry. Coarser reticulations, more rosin; finer, more alcohol.

**Varnish for Edges.**—Brunswick black is most convenient. Rule lines around

### (Photogravure)

the plate with a ruling pen, then coat the rest of the edges with brush. Or, bitumen, 1 oz.; benzole, 6 oz.; turpentine, 3 oz.

**Varnish for Back of Plate.**—Brunswick black, diluted with a small quantity of benzoline.

**Etching Bath for Talbot-Klic Process.**—Three to six different solutions of iron perchloride are used, beginning with the strongest, the general strengths being 40, 36, 33 and 30° Beaumé. After placing in the strongest bath the plate is watched to see whether there is any etching effect on the thinnest portions of the resist. If, after some time, no effect is seen, remove to the next bath. In each bath the etch (indicated by discoloring of the copper) is watched until it ceases to spread further, then the plate is transferred to the next weaker, which will penetrate some thicker portions of the resist. The etching must be stopped just before the very highest lights of the picture are attacked.

**Stock Etching Bath, To Make.**—Take 7 lb. of lump perchloride of iron, add 60 oz. of water, and heat until dissolved. To neutralize, take 10 oz. of stock solution, and drop in strong ammonia (.880), stirring rapidly, until it is quite thick; then add this to the stock solution, and boil. Cool, and allow to stand for 24 hours. Dilute with water until the proper density is shown by the hydrometer. The densities vary with the nature of the work; a useful general series is 40, 36, 33 and 30° Beaumé. Heat before use to about 80° F.

**Time of Etching.**—This varies with every plate, but an actual, timed experience of Herbert Denison will give a rough guide. Solution 45° Beaumé, no effect; 43°, 2 minutes; 40°, 4 minutes; 38°, 4 minutes; 36°, 3 minutes; 33°, 2 minutes; total, 15 minutes. The first bath that attacks the copper should not act more than 2 minutes.

**Single Etching Bath.**—Use 1 etching bath of perchloride of iron of exactly the strength 38° Beaumé at a temperature of 74 to 75° F., taking 1 dr. to every sq. in. of the surface.

**Etching Ground.**—To be applied to the face of the plate to protect it while titles or other line work are being etched. The etch ground is spread over the whole plate, and the lettering, etc., is scratched through the ground to the copper, the title being etched with perchloride of iron as used for etching the photogravure itself. White wax, 400 gr.; gum mastic, 200 gr.; asphaltum, 200 gr.; melt together, and pour them into oil of laven-

## Photography

### (Flashlights)

der,  $1\frac{1}{2}$  oz. Mix well, pour into wide-mouthed, glass-stoppered bottles, and, when set, pour a little oil of lavender on the top to prevent drying.

*After Etching.*—Remove the resist with a 5% solution of caustic potash.

*To Remove Grain.*—Use mixture of benzole and turpentine.

*The Steel Facing Solution.*—Protosulphate of iron, 1 oz.; double sulphate of iron and ammonia, 1 oz.; chloride of ammonium, 2 oz.; water, 40 oz. Dissolve, and filter.

*To Preserve Steel-Faced Plates.*—Heat well, and rub with beeswax until it melts and flows over whole plate.

*Ink for Photogravure.*—Frankfort black, 4 oz.; brown red, 1 oz. Mix with medium oil, and reduce, when using, with weak oil to suit work.

### FLASHLIGHT AND ARTIFICIAL LIGHT

*Cautions.*—Never grind potassium chlorate and sulphur together. The mixture is very explosive. Never grind any two constituents of a flash powder together. Flashlight mixtures, which are explosive, must not be used in magnesium lamps, except in such as have flat, open trays. Blow-through lamps are for pure powder only.

Sublimed sulphur, or flowers of sulphur, often contains free sulphuric acid, which is the cause of danger with flash powders containing sulphur. Wash in 3 or 4 lots of distilled water, testing until wash water is found neutral.

*Flash Powders.*—(a) Sift magnesium powder, 3 parts, on to a sheet of paper; powder potassium chlorate, 6 parts, and antimony sulphide, 1 part, separately, to the finest powder, and sprinkle over magnesium. Mix all with a feather or the dry finger, or shake together in a cardboard tube. 7 gr. burn in from 1-20 to 1-40 of a second. (b) Potassium permanganate, fine powder, 1 part; magnesium powder, 5 parts. (c) Potassium nitrate, 1 part; magnesium powder, 1 part. (d) Chrome alum, 1 part; magnesium, 1 part. All chemicals must be dry, and in finest powder. Rub each separately, in a glass or wedgwood mortar. Keep well stoppered. The above are all good powders. (e) burns rapidly, and is not liable to explode.

*Flashlight Powder, To Burn.*—A square metallic spirit lamp, having a flat top, is fitted with 2 wicks, one in front of the other, and separated by 2 or 3 inches. Immediately behind this lamp is a short, wide-mouthed bottle containing magne-

### (Flashlights)

sium in powder. Dipping into this powder is a glass tube, the other end being carried up through the cork and bent toward the flames of the spirit lamp, which are in a line with the direction of the blowpipe. A second short piece of tube is passed through the cork, its outer end being connected with the rubber tube of a pneumatic ball. On giving this ball a quick, sharp squeeze, a small quantity of the powder is suddenly ejected from the blowpipe nozzle against the flames, this being attended by a dazzling flash. This is capable of being repeated as long as any of the magnesium powder remains in the bottle.

*Flashlight Powders.*—1.—Magnesium powder, 6 oz.; potassium chlorate, 12 oz.; antimony sulphide, 2 oz.; 75 to 150 gr. of the powder should be used.

2.—Guncotton, 15 gr., and magnesium powder, 30 gr., are used.

3.—Magnesium, 40%; permanganate of potassium, 40%; peroxide of barium, 20%.

4.—Purchase 1 oz. of magnesium powder and 1 oz. of negative guncotton from dealers in photographic materials. Place on a dustpan enough cotton, when pulled out, to measure about  $3\frac{1}{2}$  in. in diameter. Sprinkle it over with 20 gr. of magnesium powder to form a thin, even film. Lay over the magnesium, thus arranged, a very thin layer of guncotton. Connect to the bunch of cotton a small fuse of twisted cotton about 6 in. long, so that it will extend to the side of the dustpan. Then set the pan on a stepladder near the object, and, when ready, light the guncotton fuse with a match, when instantly a brilliant flash will ensue. There are several ready prepared magnesium compounds now sold, with special devices and lamps to fire them.

5.—For photographing the interior of very large caves in such a manner as to obtain every possible detail, the following is recommended: Magnesium, in powder, 20 parts; barium nitrate, 30 parts; flower of sulphur, 4 parts; beef suet, 7 parts. Melt the suet, and add the other ingredients after having first mixed them by passing through a fine sieve. When thoroughly stirred in, pour the mass into zinc boxes of a suitable size. A box 3 in. in diameter and 4 in. deep will hold about 1 lb., and will give a flash of 20,000 candle power. Such a flash, used in signaling in France, has been seen at a distance of 100 kilometers, or about 62 miles.

6.—German patents have been granted on a series of slow combustion flashlight



## Photography

### (Flashlights)

powders of the following composition:

(a) Potassium permanganate, 30 parts; zinc filings, 10 parts; magnesium powder, 10 parts; iron, fine filings, to 100 parts.  
(b) Potassium nitrate, 30 parts; iron, fine filings, 30 parts; magnesium powder, 20 parts; aluminum powder, to 100 parts.  
(c) Barium peroxide, 33.3 parts; magnesium powder, 33.3 parts; aluminum powder, 33.3 parts. When any of these powders is ignited it gives, at first, a reddish light, of low actinic value; the light gradually becomes more and more intense, until a maximum of actinic effect is reached. This slow combustion offers an advantage over the old rapidly acting flashlight powders, in that the eyes of sitters become gradually accustomed to the flash; hence the pictures do not present the staring eyes that are so offensive in the majority of flashlight photographs.

**A Safe Flash.**—Soak blotting paper for a few minutes in a strong solution of potassium nitrate (saltpeter). Hang up to dry. Dry unoxidized magnesium powder may be spread on this, with the result of a combined touchpaper and flashlight.

**A Slow Flash-Torch Mixture.**—Nitrate of baryta, 12 oz.; powdered magnesium, 10 oz.; potassium chlorate, 3 oz.; flowers of sulphur, 2 oz.; melted fat from beef suet, 6 oz. Add first the nitrate of baryta, then the magnesium, chlorate of potassium, and lastly the sulphur, to the fat, in a warm state, in an earthen pot, stirred with a glass rod. When the mixture is in the condition of a thick paste pack it in boxes of zinc or aluminum, not tinplate. The boxes burn with the mixture, and add to the light.

**Flash Sheets.**—Prepare glass plates by cleaning them well, and polishing with talc powder or French chalk. Mix flexible collodion, 5 oz.; powdered magnesium, 2 oz.; potassium chlorate, powdered, 20 gr.; in alcohol, 1 oz. Add the magnesium, then the potassium chlorate dissolved in the alcohol; shake the mixture well in a wide-mouthed bottle; pour a pool of this preparation upon the center of one of the plates; allow it to flow all over so as to extend to each corner; then lay the plate upon a slab of slate or marble that has been previously leveled, so that it may become well set. At no time must this preparation be used near a naked flame, because the vapor is very inflammable. When the coating is quite dry, cut around  $\frac{1}{4}$  in. from the outer edges with a penknife and straight-edge; lift the film at one corner, when it will leave the plate, and can be cut in halves, and

### (Flashlights)

stored between sheets of thin paper. To use, pin to any convenient holder, and light one corner with a match.

**A Slow Flash Powder.**—Powdered shellac, 2 oz.; nitrate of baryta,  $\frac{1}{2}$  oz.; chlorate of potassium, 1 oz.; powdered magnesium, 2 oz. The shellac causes slow burning. Keep dry.

**Magnesium-Aluminum Flash.**—Substitute  $\frac{1}{4}$  of the magnesium by a similar amount of aluminum. Improvement claimed.

**Flashlight (Orthochromatic).**—Lithium carbonate, 1 part; calcium carbonate, 1 part; magnesium powder, 20 parts.

**Flashlight, Panchromatic.**—Flashlight powder, 1 oz.; strontium oxalate, 50 gr.; sodium oxalate, 50 gr. Or, Pure magnesium, 1 oz.; ammonium nitrate, 25 gr.; strontium oxalate, 50 gr.; sodium oxalate, 50 gr. Use a medium yellow light filter.

**To Prevent Smoke from Flashlight.**—To prevent the smoke from magnesium ribbon or powder from spreading throughout the room, support over the point where the ignition is to take place a large flat pad of damp wool lint. This may be done by tacking the lint to the underside of a board supported on legs. When ignition takes place, the products of combustion, for the most part, will become absorbed by the wool.

**Touchpaper.**—Mix potassium chlorate and antimony sulphide (previously finely powdered separately) in equal parts; add French polish i.e., strong shellac solution in spirit—to make a thick cream, and apply evenly to paper. Dry without application of heat, and cut into strips about  $\frac{1}{4}$  in. broad. Or, soak thin blotting paper in a solution of saltpeter (about 10%) for a few minutes, then dry.

**Aluminum.**—Bronze powder is usually slightly greasy. The oil is purposely added in the manufacture to make the powder more suitable for its ordinary decorative purposes. Photographers should insist upon having it free from this addition, and should also see that it is quite fine and flourlike. For oil, test as with magnesium.

**A Smoke Bag,** consisting of fine muslin, loosely stretched over a few light hoops of wire or cane, and large enough to allow the flash to be contained within it without fear of catching alight, is most useful.

**Fireproofing Muslin.**—Ammonium phosphate, 5 oz.; common salt, 2 oz.; water, 90 oz. Heat to 120° F., and soak the muslin for half an hour or so, then hang to dry. After washing, the muslin will always need re-fireproofing.

## CHAPTER XXI

# PRESERVING AND CANNING, CONDIMENTS, FOOD PREPARATIONS, ETC.

### FRUIT, PRESERVING AND CANNING

#### Caution.

The provisions of the "Food and Drugs Act" must not be violated in putting up food preparations. If you use a coloring or preserving agent other than those particularized in the law as permissible, and provided they are *not* expressly prohibited by the law, you *must* note the name and quantity on the label, as prescribed by the law. The laws relating to adulterations are very severe, and it is unwise to contravene them. For detailed information as to what can and what cannot be done, consult the Department of Agriculture, Washington, D. C.

#### Utensils Needed for Canning and Preserving.

In preserving, canning and jelly-making, iron or tin utensils should never be used. The fruit acids attack these metals and give a bad color and metallic taste to the products. The preserving kettles should be porcelain lined, enameled, or of a metal that will not form troublesome chemical combinations with fruit acids. The kettles should be broad, rather than deep, as the fruit should not be cooked in deep layers. Nearly all the necessary utensils may be found in some ware not subject to chemical action. A list of the most essential articles follows:

Two preserving kettles, 1 colander, 1 fine strainer, 1 skimmer, 1 ladle, 1 large-mouthed funnel, 1 wire frying basket, 1 wire sieve, 4 long-handled wooden spoons, 1 wooden masher, a few large pans, knives for paring fruit (plated, if possible), flat-bottomed clothes boiler, wooden or willow rack to put in the bottom of the boiler, iron tripod or ring, squares of cheese cloth. In addition, it would be well to have a flannel straining bag, a frame on which to hang the bag, a syrup gauge, and a glass cylinder, a fruit pricker, and plenty of clean towels.

The regular kitchen pans will answer for holding and washing the fruit. Mixing bowls and stone crocks can be used for holding the fruit juice and pared fruit. When fruit is to be plunged into boiling water for a few minutes before par-



Wire Basket

ing, the ordinary stewpans may be employed for this purpose.

If canning is done by the oven process, a large sheet of asbestos, for the bottom of the oven, will prevent the cracking of jars.

The wooden rack on which the bottles rest in the washboiler is made in this manner: Have two strips of wood measuring 1 in. high, 1 in. wide, and 2 in. shorter than the length of the boiler. On these pieces of wood tack thin strips of wood that are 1½ in. shorter than the width of the boiler. These cross strips should be about 1 in. wide, and there should be an inch between two strips. This rack will support the jars, and will admit the free circulation of boiling wa-

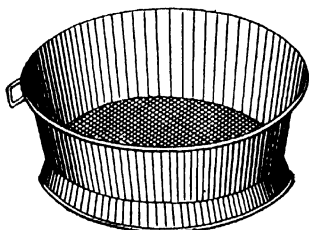
Always consult the Index when using this book.

## Preserving, Canning, Etc.

### (Utensils)

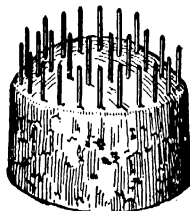
ter about them. Young willow branches, woven into a mat, also make a good bed for bottles and jars.

The wire basket is a saver of time and strength. The fruit to be peeled is put into the basket, which is lowered into a deep kettle partially filled with boil-



Wire Sieve

ing water. After a few minutes the basket is lifted from the boiling water, plunged for a moment into cold water, and the fruit is ready to have the skin drawn off.



Fruit Pricker

A strong wire sieve is a necessity when purées of fruit are to be made. These sieves are known as purée sieves. They are made of strong wire, and, in addition, have supports of still stronger wire.

A fruit pricker is easily made, and saves time. Cut a piece half an inch deep from a broad cork; press through this a dozen or more coarse darning needles; tack the cork on a piece of board. Strike the fruit on the bed of needles, and you have a dozen holes at once. When the work is finished remove the cork from the board, wash and dry thoroughly. A little oil on the needles will prevent rusting. With needles of the size suggested there is little danger of the points break-

### (Utensils)

ing, but it is worth remembering that the use of pricking machines was abandoned in curing prunes on a commercial scale in California because the steel needles broke and remained in the fruit.



Wooden Vegetable Masher

A wooden vegetable masher is indispensable when making jellies and purées.

A syrup gauge and glass cylinder are not essential to preserving, canning and jelly-making, but they are valuable aids in getting the right proportion of sugar for fruit or jelly. The syrup gauge costs about 50 cents and the cylinder about 25 cents. A lipped cylinder that holds a little over a gill is the best size.

Small iron rings, such as sometimes come off the hubs of cart wheels, may be used instead of a tripod for slightly raising the preserving kettle from the hot stove or range.

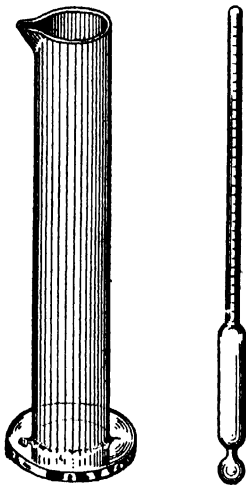
To make a flannel straining bag, take a square piece of flannel (27 by 27 in. is a good size), fold it to make a three-cornered bag, stitch one of the sides, cut the top square across, bind the opening with strong, broad tape, stitch on this binding four tapes, with which to tie the bag to a frame.

To use this bag, tie it to a strong frame, or to the backs of two kitchen chairs. If the chairs are used, place some heavy articles in them; or the bag may hang on a pole (a boom handle) which rests on the backs of the chairs. A high

## Preserving, Canning, Etc.

### (Selection of Fruit)

stool, turned upside down, makes a good support for the bag. Put a bowl on the floor, under the bag; then pour in the fruit juice, which will pass through comparatively clear. Before it is used, the bag should be washed and boiled in clear water.



Glass Cylinder (A) and Syrup Gauge (B)

### Selection and Preparation of the Fruit.

1.—The selection of fruit is one of the first steps in obtaining successful results. The flavor of fruit is not developed until it is fully ripe, but the time at which the fruit is at its best for canning, jelly-making, etc., is just before it is perfectly ripe. In all soft fruits, the fermentative stage follows closely upon the perfectly ripe stage; therefore, it is better to use underripe rather than overripe fruit. This is especially important in jelly-making, for another reason also: In overripe fruit the pectin begins to lose its jelly-making quality.

2.—All fruits should, if possible, be freshly picked for preserving, canning and jelly-making. No imperfect fruit should be canned or preserved. Gnarly fruit may be used for jellies or marmalades by cutting out defective portions. Bruised spots should be cut out of peaches and

### (Selection of Fruit)

pears. In selecting small-seeded fruits, like berries, for canning, those having a small proportion of seed to pulp should be chosen. In dry seasons berries have a larger proportion of seeds to pulp than in a wet or normal season, and it is not wise to can or preserve such fruit unless the seeds are removed. The fruit should be rubbed through a sieve that is fine enough to keep back the seeds. The strained pulp can be preserved as a purée or marmalade.

3.—When fruit is brought into the house, put it where it will keep cool and crisp until you are ready to use it.

4.—Begin by having the kitchen swept and dusted thoroughly, that there need not be a large number of mold spores floating about. Dust with a damp cloth. Have plenty of hot water, and pans in which jars and utensils may be sterilized. Have at hand all necessary utensils, towels, sugar, etc.

5.—Prepare only as much fruit as can be cooked while it still retains its color and crispness. Before beginning to pare fruit, have some syrup ready, if that is to be used; or if sugar is to be added to the fruit, have it weighed or measured.

6.—Decide upon the amount of fruit you will cook at one time, then have two bowls—one for the sugar and one for the fruit—that will hold just the quantity of each. As the fruit is pared or hulled, as the case may be, drop it into its measuring bowl. When the measure is full put the fruit and sugar in the preserving kettle. While this is cooking, another measure may be prepared, and put in the second preserving kettle. In this way the fruit is cooked quickly and put in the jars and sealed at once, leaving the pans ready to sterilize another set of jars.

7.—If the fruit is to be preserved or canned with syrup, it may be put into the jars as fast as it is prepared. As soon as a jar is filled pour in enough syrup to cover it.

8.—If several people are helping, and large kettles are being used for the preserving, or where fruit (like quinces and hard pears) must be first boiled in clear water, the pared fruit should be dropped into a bowl of cold water made slightly acid with lemon juice (1 tablespoonful of lemon juice to 1 qt. of water). This will keep the fruit white.

9.—All large, hard fruit must be washed before paring. Quinces should be rubbed with a coarse towel before they are washed.

## Preserving, Canning, Etc.

### (Syrup)

10.—If berries must be washed, do the work before stemming or hulling them. The best way to wash berries is to put a small quantity into a colander and pour cold water over them; then turn them on a sieve to drain. All this work must be done quickly, that the fruit may not absorb much water.

11.—Do not use the fingers for hulling strawberries. A simple huller can be bought for 5 cents.

12.—If practicable, pare fruit with a silver knife, so as not to stain or darken the product. The quickest and easiest way to peel peaches is to drop them into boiling water for a few minutes. Have a deep kettle a little more than half full of boiling water; fill a wire basket with peaches; put a long-handled spoon under the handle of the basket and lower into the boiling water. At the end of three minutes lift the basket out by slipping the spoon under the handle. Plunge the basket for a moment into a pan of cold water. Let the peaches drain a minute, then peel. Plums and tomatoes may be peeled in the same manner.

13.—If the peaches are to be canned in syrup, put them at once into the sterilized jars. They may be canned whole or in halves. If in halves, remove nearly all the stones or pits. For the sake of the flavor, a few stones should be put in each jar.

14.—When preparing cherries, plums or crab apples for canning or preserving, the stem, or a part of it, may be left on the fruit.

15.—When preparing to make jelly, have ready the cheese-cloth strainer, enameled colander, wooden spoons, vegetable masher, measures, tumblers, preserving kettles and sugar.

16.—If currant jelly is to be made, free the fruit from leaves and large stems. If the jelly is to be made from any of the other small fruits, the stems and hulls must be removed.

17.—When the jelly is to be made from any of the large fruits the important part of the preparation is to have the fruit washed clean, then to remove the stem and the blossom end. Nearly all the large fruits are better for having the skin left on. Apples and pears need not be cored. There is so much gummy substance in the cores of quinces that it is best not to use this portion in making fine jelly.

### Making Syrup for Use in Canning and Preserving.

1.—Such syrups as are used in canning and preserving are made with varying proportions of water and sugar. When

### (Syrup)

the proportion of sugar is large, and that of the water small, the syrup is said to be heavy. When the water predominates the syrup is light.

2.—There are several methods of measuring the proportion of sugar in a syrup. The most scientific and accurate is with the syrup gauge. Careful measurement or weighing is, however, quite satisfactory for all ordinary work if the syrup need not be boiled a long time. In boiling, the water evaporates, and the syrup grows thicker and richer. The amount of evaporation depends upon the surface exposed and the pressure of the atmosphere. For example, if a large quantity of syrup is boiled in a deep kettle the evaporation will not be rapid. If the same quantity of syrup were boiled the same length of time in a broad, shallow kettle, the water would evaporate more rapidly, and the syrup would be thicker and heavier. If a given quantity of syrup were boiled the same length of time in a high altitude, Colorado, for example, and at the sea-level, it would be found that the syrup boiled at the sea-level would be thicker and less in volume than that boiled in Colorado. From this it will be seen that it is difficult to say what proportion of sugar a syrup will contain after it has been boiling 10 or more minutes. Of course, by the use of the syrup gauge the proportion of sugar in a syrup may be ascertained at any stage of the boiling. After all, however, it is possible to measure sugar and water so that you can know the percentage of sugar when the syrup begins to boil. The following statement gives the percentage of sugar at the time when the syrup has been boiling 1 minute, and also what kind of syrup is suitable for the various kinds of fruit:

a.—1 pt. of sugar and 1 gill of water gives syrup of 40° density. Use for preserved strawberries and cherries.

b.—1 pt. of sugar and  $\frac{1}{2}$  pt. of water gives syrup of 32° density.

c.—1 pt. of sugar and 3 gills of water gives syrup of 28° density. Use either this or the preceding for preserved peaches, plums, quinces, currants, etc.

d.—1 pt. of sugar and 1 pt. of water gives syrup of 24° density. Use for canned acid fruits.

e.—1 pt. of sugar and  $1\frac{1}{2}$  pt. of water gives syrup of 17° density.

f.—1 pt. of sugar and 2 pt. of water gives syrup of 14° density. Use either of these two light syrups for canned pears, peaches, sweet plums and cherries, raspberries, blueberries and blackberries.

## Preserving, Canning, Etc.

### (Canning Fruit)

3.—The lightest syrups may be used for filling up the jars after they are taken from the oven or boiler. The process of making a syrup is very simple, but there are a few points that must be observed if syrup and fruit are to be perfect. Put the sugar and water in the saucepan and stir on the stove until all the sugar is dissolved. Heat slowly to the boiling point, and boil gently, without stirring. The length of time that the syrup should boil will depend upon how rich it is to be. All syrups are better for boiling them from 10 to 30 minutes. If rich syrups are boiled hard, jarred, or stirred, they are apt to crystallize. The syrup may be made a day or two in advance of canning time. The light syrups will not keep long unless sealed, but the heavy syrups keep well if covered well.

*Use of the Syrup Gauge.*—1.—The syrup gauge is a graduated glass tube, with a weighted bulb, that registers from 0 to 50°, and that is employed to determine the quantity of sugar contained in a syrup.

2.—If this gauge is placed in pure water, the bulb will rest on the bottom of the cylinder or other container. If sugar be dissolved in the water the gauge will begin to float. The more sugar there is dissolved in the water the higher the gauge will rise. In making tests, it is essential that the syrup should be deep enough to reach the zero point of the gauge. If a glass cylinder holding about  $\frac{1}{2}$  gill is filled to about two-thirds its height, and the gauge is then placed in the cylinder, the quantity of sugar in the syrup will be registered on the gauge.

3.—Experiments have demonstrated that when sugar is dissolved and heated in fruit juice, if the syrup gauge registers 25°, the proportion of sugar is exactly right for combining with the pectin bodies to make jelly. The syrup gauge and the glass cylinder must both be heated gradually, that the hot syrup may not break them. If the gauge registers more than 25°, add a little more fruit juice. If, on the other hand, it registers less than 25°, add more sugar. In making syrups for canning and preserving fruits, the exact amount of sugar in a syrup may be ascertained at any stage of boiling, and the syrup be made heavier by adding sugar, or lighter by adding water, as the case demands.

### CANNING FRUIT

This method of preserving fruit for home use is, from all points, the most desirable. It is the easiest, and commonly

### (Canning Fruit)

considered the most economical and the best, because the fruit is kept in a soft and juicy condition, in which it is believed to be easily digested. The wise housekeeper will can her principal fruit supply, making only enough rich preserves to serve for variety and for special occasions.

The success of canning depends upon absolute sterilization. If the proper care is exercised, there need be no failure, except in rare cases, when a spore has developed in the can. There are several methods of canning, and while the principle is the same in all methods, the conditions under which the housekeeper must do her work may, in her case, make one method more convenient than another. For this reason three will be given which are considered the best and easiest. These are: Cooking the fruit in the jars, in an oven; cooking the fruit in the jars, in boiling water; and stewing the fruit before it is put in the jars. The quantity of sugar may be increased if the fruit is liked sweet. It is most important that the jars, covers, and rubber rings be in perfect condition. Examine each jar and cover to see that there is no defect in it. Use only fresh rubber rings, for if the rubber is not soft and elastic the sealing will not be perfect. Each year numbers of jars of fruit are lost because of the false economy in using an old ring that has lost its softness and elasticity. Having the jars, covers and rings in perfect condition, the next thing is to wash and sterilize them. Have two pans partially filled with cold water. Put some jars in one, laying them on their sides, and some covers in the other. Place the pans on the stove, where the water will heat to the boiling point. The water should boil at least 10 or 15 minutes. Have on the stove a shallow milk pan in which there is about 2 in. of boiling water. Sterilize the cups, spoons, and funnel, if you use one, by immersing in boiling water for a few minutes. When ready to put the prepared fruit in the jars, slip a broad skimmer under a jar and lift it, and drain free of water. Set the jar in the shallow milk pan, and fill to overflowing with the boiling fruit. Slip a silver-plated knife, or the handle of a spoon, around the inside of the jar, that the fruit and juice may be packed solidly. Wipe the rim of the jar, dip the rubber ring in boiling water, and put it smoothly on the jar, then put on the cover, and fasten. Place the jar on a board, and out of a draught of cold air. The work of filling and sealing must be

## Preserving, Canning, Etc.

### (Canning Fruit)

done rapidly, and the fruit must be boiling hot when it is put into the jars. If screw-covers are used, it will be necessary to tighten them after the glass has cooled and contracted. When the fruit is cold wipe the jars with a wet cloth. Paste on the labels, if any, and put the jars on shelves in a cool, dark closet. In canning, any proportion of sugar may be used, or fruit may be canned without the addition of any sugar. However, that which is designed to be served as a sauce should have the sugar cooked with it. Fruit intended for cooking purposes need not have the sugar added to it. Juicy fruits, such as berries and cherries, require little or no water. Strawberries are better not to have water added to them. The only exception to this is when they are cooked in a heavy syrup.

#### Canned Fruit Cooked in the Oven.

Cover the bottom of the oven with a sheet of asbestos, the kind plumbers employ in covering pipes. It is very cheap, and may usually be found at plumbers' shops. If the asbestos is not available, put into the oven shallow pans in which there are about 2 in. of boiling water. Sterilize the jars and utensils. Make the syrup; prepare the fruit the same as for cooking in the preserving kettle. Fill the hot jars with it, and pour in enough syrup to fill the jar solidly. Run the blade of a silver-plated knife around the inside of the jar. Place the jars in the oven, either on the asbestos or in the pan of water. The oven should be moderately hot. Cook the fruit 10 minutes; remove from the oven, and fill the jar with boiling syrup. Wipe, and seal. Place the jars on a board and out of a draft of air. If the screw covers are used, tighten them after the glass has cooled. Large fruits, such as peaches, pears, quinces, crab apples, etc., will require about 1 pt. of syrup to each quart jar of fruit. The small fruit will require a little over  $\frac{1}{2}$  pt. of syrup. The amount of sugar in each quart of syrup should be regulated to suit the fruit with which it is to be used.

#### Canned Fruit Cooked in a Water Bath.

Prepare the fruit and syrup as for cooking in the oven. Fill the sterilized jars and put the covers on loosely. Have a wooden rack in the bottom of a wash boiler. Put in enough warm water to come to about 4 in. above the rack. Place the filled jars in the boiler, but do not let them touch one another. Pack clean white cotton rags, or, perhaps better, cotton rope,

### (Canning Fruit)

between and around the jars to prevent them from striking one another when the water begins to boil. Cover the boiler, and let the fruit cook 10 minutes from the time the water surrounding it begins to boil. Draw the boiler back and take off the cover. When the steam passes off take out one jar at a time and place in a pan of boiling water beside the boiler, fill up with boiling syrup, and seal. Put the jars on a board, and do not let cold air blow upon them. If screw-covers are used, tighten them when the glass has cooled and contracted.

#### Receipts for Canning Fruit.

*Blackberries.*—The same as for raspberries.

*Blueberries.*—Berries, 12 qt.; sugar, 1 qt.; water, 1 pt. Put water, berries and sugar in the preserving kettle; heat slowly. Boil 15 minutes, counting from the time the contents of the kettle begin to bubble.

*Cherries.*—Cherries, 6 qt.; sugar,  $1\frac{1}{2}$  qt.; water,  $\frac{1}{2}$  pt. Measure the cherries after the stems have been removed. Stone them or not, as you please. If you stone them, be careful to save all the juice. Put the sugar and water in the preserving kettle, and stir over the fire until the sugar is dissolved. Put in the cherries, and heat slowly to the boiling point. Boil 10 minutes, skimming carefully.

*Crab Apples.*—Apples, 6 qt.; sugar,  $1\frac{1}{2}$  qt.; water, 2 qt. Put the sugar and water into the preserving kettle. Stir over the fire until the sugar is dissolved. When the syrup boils, skim it. Wash the fruit, rubbing the blossom end well. Put it in the boiling syrup and cook gently until tender. It will take from 20 to 30 minutes, depending upon the kind of crab apples.

*Currants.*—Currants, 12 qt.; sugar, 4 qt. Treat the same as for raspberries.

*Gooseberries.*—Berries, 6 qt.; sugar,  $1\frac{1}{2}$  qt.; water, 1 pt. For green gooseberries dissolve the sugar in the water, then add the fruit, and cook 15 minutes. Ripe gooseberries are to be treated the same as the green fruit, but use only half as much water. Green gooseberries may also be canned the same as rhubarb.

*Grapes.*—Grapes, 6 qt.; sugar, 1 qt.; water, 1 gill. Squeeze the pulp of the grapes out of the skins. Cook the pulp 5 minutes, and then rub through a sieve that is fine enough to hold back the seeds. Put the water, skins and pulp into the preserving kettle and heat slowly to the boiling point. Skim the fruit, and then

## Preserving, Canning, Etc.

### (Canning Fruit)

add the sugar. Boil 15 minutes. Sweet grapes may be canned with less sugar; very sour ones may have more.

**Peaches.**—Peaches, 8 qt.; sugar, 1 qt.; water, 3 qt. Put the sugar and water together, and stir over the fire until the sugar is dissolved. When the syrup boils, skim it. Draw the kettle back where the syrup will keep hot but not boil. Pare the peaches, cut in halves, and remove the stones, unless you prefer to can the fruit whole. Put a layer of the prepared fruit into the preserving kettle and cover with some of the hot syrup. When the fruit begins to boil, skim carefully. Boil gently for 10 minutes, then put in the jars and seal. If the fruit is not fully ripe it may require a little longer time to cook. It should be so tender that it may be pierced easily with a silver fork. It is best to put only one layer of fruit in the preserving kettle. While this is cooking the fruit for the next batch may be pared.

**Pears.**—If the fruit is ripe it may be treated exactly the same as peaches. If, on the other hand, it is rather hard, it must be cooked until so tender that a silver fork will pierce it readily.

**Plums.**—Plums, 8 qt.; sugar, 2 qt.; water, 1 pt. Nearly all kinds of plums can be cooked with the skins on. If it is desired to remove the skin of any variety, plunge them in boiling water for a few minutes. When the skins are left on, prick them thoroughly with the fruit-pricker to prevent bursting. Put the sugar and water into the preserving kettle and stir over the fire until the sugar is dissolved. Wash and drain the plums. Put some of the fruit in the boiling syrup. Do not crowd it. Cook 5 minutes; fill and seal the jars. Put more fruit in the syrup. Continue in this manner until all the fruit is done. It may be that there will not be sufficient syrup toward the latter part of the work; for this reason it is well to have a little extra syrup on the back of the stove.

**Quinces.**—1.—Quinces, pared, cored and quartered, 4 qt.; sugar, 2 qt.; water, 1 qt. Boil the fruit in clear water until it is tender, then skim out and drain. Put the 2 qt. of sugar and 1 qt. of water in the preserving kettle; stir until the sugar is dissolved. Let it heat slowly to the boiling point. Skim well, and boil for 20 minutes. Pour one-half of the syrup into a second kettle. Put one-half of the cooked and drained fruit into each kettle. Simmer gently for half an hour, then put in sterilized jars. The water in which the fruit was boiled can be used

### (Preserving Fruit)

with the parings, cores and gnarly fruit to make jelly.

2.—Quinces, pared, cored and quartered, 4 qt.; sugar, 1½ qt.; water, 2 qt. Rub the fruit hard with a coarse crash towel, then wash and drain. Pare, core and quarter; drop the pieces into cold water. Put the fruit in the preserving kettle with cold water to cover it generously. Heat slowly, and simmer gently until tender. The pieces will not all require the same time to cook. Take each piece up as soon as it is so tender that a silver fork will pierce it readily. Drain on a platter. Strain the water in which the fruit was cooked through cheese cloth. Put 2 qt. of the strained liquid and the sugar into the preserving kettle; stir over the fire until the sugar is dissolved. When it boils skim well, and put in the cooked fruit. Boil gently for about 20 minutes.

**Raspberries.**—Raspberries, 12 qt.; sugar, 2 qt. Put 2 qt. of the fruit in the preserving kettle; heat slowly on the stove; crush with a wooden vegetable masher; spread a square of cheese cloth over a bowl and turn the crushed berries and juice into it. Press out the juice, which turn into the preserving kettle; add the sugar, and put on the stove; stir until the sugar is dissolved. When the syrup begins to boil add the remaining 10 qt. of berries. Let them heat slowly. Boil 10 minutes, counting from the time they begin to bubble. Skim well while boiling. Put in cans, and seal as directed.

**Raspberries and Currants.**—Raspberries, 10 qt.; currants, 3 qt.; sugar, 2½ qt. Heat, crush, and press the juice from the currants, and proceed as directed for raspberries.

**Rhubarb.**—Cut the rhubarb when it is young and tender. Wash it thoroughly, and then pare; cut into pieces about 2 in. long. Pack in sterilized jars. Fill the jars to overflowing with cold water and let them stand 10 minutes. Drain off the water and fill again to overflowing with fresh cold water. Seal with sterilized rings and covers. When required for use, treat the same as fresh rhubarb. Green gooseberries may be canned in the same manner. Rhubarb may be cooked and canned with sugar in the same manner as gooseberries.

### PRESERVING FRUIT

In the case of most fruits, canning with a little sugar is to be preferred to preserving with a large quantity of sugar. There are, however, some fruits that are



## Preserving, Canning, Etc.

### (Preserving Fruit)

only good when preserved with a good deal of sugar. Of course, such preparations of fruits are only desirable for occasional use. The fruits best adapted for preserving are strawberries, sour cherries, sour plums and quinces. Such rich preparations should be put up in small jars or tumblers.

#### Fruit Preserved in Grape Juice.

Any kind of fruit can be preserved by this method, but it is particularly good for apples, pears and sweet plums. No sugar need be used in this process. Boil 6 qt. of grape juice in an open preserving kettle until it is reduced to 4 qt. Have the fruit washed and pared, and, if apples or pears, quartered and cored. Put the prepared fruit in a preserving kettle, and cover generously with the boiled grape juice. Boil gently until the fruit is clear and tender, then put in sterilized jars.

#### Jelly, Methods of Making.

In no department of preserving does the housekeeper feel less sure of the result than in jelly-making. The rule that works perfectly one time fails another time. Why this is so the average housekeeper does not know; so there is nearly always an element of uncertainty as to the result of the work. These two questions are being constantly asked: "Why does not my jelly harden?" "What causes my jelly to candy?" It is an easy matter to say that there is something in the condition of the fruit, or that the fruit juice and sugar were cooked too short or too long a time. These explanations are often true, but they do not help the inquirer, since at other times just that proportion of sugar and time of cooking have given perfect jelly. In the following pages an attempt is made to give a clear explanation of the principles underlying the process of jelly-making.

*Selection and Handling of Fruit for Jelly-Making.*—An acid fruit is the most suitable for jelly-making, though in some of the acid fruits, the strawberry, for example, the quantity of the jelly-making pectin is so small that it is difficult to make jelly with this fruit. If, however, some currant juice be added to the strawberry juice, a pleasant jelly will be the result; yet, of course, the flavor of the strawberry will be modified. Here is a list of the most desirable fruits for jelly-making. The very best are given first: Currant, crab apple, apple, quince, grape, blackberry, raspberry, peach.

1.—Apples make a very mild jelly, and

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it may be flavored with fruits, flowers or spices. If the apples are acid it is not advisable to use any flavor.

2.—Juicy fruits, such as currants, raspberries, etc., should not be gathered after a rain, for they will have absorbed so much water as to make it difficult, without excessive boiling, to get the juice to jelly.

3.—If berries are sandy or dusty, it will be necessary to wash them, but the work should be done very quickly, so that the fruit may not absorb much water.

4.—Large fruits, such as apples, peaches and pears, must be boiled in water until soft. The strained liquid will contain the flavoring matter and pectin.

5.—It requires more work and skill to make jellies from the fruits to which water must be added than from the juicy fruits. If the juicy fruits are gathered at the proper time one may be nearly sure that they contain the right proportion of water. If gathered after a rain, the fruit must be boiled a little longer, that the superfluous water may pass off in steam.

6.—In the case of the large fruits, a fair estimate is 3 qt. of strained juice from 8 qt. of fruit and about 4 qt. of water. If the quantity of juice is greater than this it should be boiled down to 3 qt.

7.—Apples will always require 4 qt. of water to 8 qt. of fruit, but juicy peaches and plums will require only 3 or 3½ qt.

8.—The jelly will be clearer and finer if the fruit is simmered gently and not stirred during the cooking.

9.—It is always best to strain the juice first through cheese cloth, and without pressure. If the cloth is double the juice will be quite clear. When a very clear jelly is desired, the strained juice should pass through a flannel or felt bag. The juice may be pressed from the fruit left in the strainer, and used in marmalade or for a second-quality jelly.

10.—To make jelly that will not crystallize (candy), the right proportion of sugar must be added to the fruit juice. If the fruit contains a high percentage of sugar, the quantity of added sugar should be a little less than the quantity of fruit juice. That is to say, in a season when there has been a great deal of heat and sunshine there will be more sugar in the fruit than in a cold, wet season; consequently, 1 pt. of currant juice will require but ¾ pt. of sugar. But in a cold, wet season the pint of sugar for the pint of juice must be measured generously. Another cause of the jelly crystallizing is hard boiling. When

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the syrup boils so rapidly that particles of it are thrown on the upper part of the sides of the preserving kettle, they often form crystals. If these crystals are stirred into the syrup they are apt to cause the mass to crystallize in time.

11.—The use of the syrup gauge, and care not to boil the syrup too violently, would do away with all uncertainty in jelly-making. The syrup gauge should register 25°, no matter what kind of fruit is used. Jellies should be covered closely and kept in a cool, dry, dark place.

**Preparation of the Glasses for Jelly.**—Sterilize the glasses; take from the boiling water and set them in a shallow baking pan in which there is about 2 in. of boiling water.

**Covering Jellies.**—Jellies are so rich in sugar that they are protected from bacteria and yeasts, but they must be covered carefully to protect them from mold spores and evaporation. The following methods of covering jellies are good: Have disks of thick white paper, the size of the top of the glass. When the jelly is set, brush the top over with brandy or alcohol. Dip a disk of paper in the spirits and put it on the jelly. If the glasses have covers, put them on. If there are no covers, cut disks of paper about  $\frac{1}{2}$  in. in diameter larger than the top of the glass. Beat together the white of 1 egg and 1 tablespoonful of cold water. Wet the paper covers with this mixture and put over the glass, pressing down the sides well to make them stick to the glass; or the covers may be dipped in olive oil and be tied on the glasses; but they must be cut a little larger than when the white of egg is used. A thick coating of paraffine makes a good cover, but not quite so safe as the paper dipped in brandy or alcohol, because the spirits destroy any mold spores that may happen to rest on the jelly. If such spores are covered with the paraffine they may develop under it. However, the paper wet with spirits could be put on first and the paraffine poured over it. If paraffine is used, break it into pieces and put in a cup. Set the cup in a pan of warm water, on the back of the stove. In a few moments it will be melted enough to cover the jelly. Have the coating about  $\frac{1}{4}$  in. thick. In cooling, the paraffine contracts, and if the layer is very thin it will crack, and leave a portion of the jelly exposed.

### Marmalades.

Marmalades require great care while cooking, because no moisture is added to

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the fruit and sugar. If the marmalade is made from berries, the fruit should be rubbed through a sieve to remove the seeds. If large fruit is used, have it washed, pared, cored and quartered. Measure the fruit and sugar, allowing 1 pt. of sugar to each quart of fruit. Rinse the preserving kettle with cold water; that there may be a slight coat of moisture on the sides and bottom. Put alternate layers of fruit and sugar in the kettle, having the first layer fruit. Heat slowly, stirring frequently. While stirring, break up the fruit as much as possible. Cook about 2 hours, then put in small sterilized jars.

### Receipts for Preserves, Jams, Jellies, Marmalades, etc.

The following recipes are arranged alphabetically, according to the fruits to be used.

**Apple Jam.**—To each pound of fruit, weighed after being pared, cored and sliced, allow  $\frac{3}{4}$  lb. of preserving sugar, the finely grated rind of 1 lemon and the juice of  $\frac{1}{2}$  lemon. Choose firm, sound apples of the same kind; peel, core, and cut them into thick slices. Barely cover the bottom of a large stewjar with cold water, add a good layer of sliced apples, cover thickly with sugar, and sprinkle with lemon rind and lemon juice. Repeat until all the materials are used, cover the jar closely, place it on the stove, or in a moderate oven, in a tin half full of boiling water, and stew gently until the apples are tender. If the preparation appears rather dry it may at once be put into the pots; if not, the lid must be removed, the stewjar taken out of the water and placed on the stove, and the contents boiled and stirred until the greater part of the moisture has evaporated. Requires from  $2\frac{1}{2}$  to 3 hours.

**Apple and Blackberry Jam.**—Apples, 4 lb.; blackberries, 2 lb.; preserving sugar,  $4\frac{1}{2}$  lb. Pick the blackberries, put them into a stewjar with 1 lb. of sugar, and let them remain thus for at least 12 hours. When ready, place the jar on the stove, or in a cool oven, and stew gently until the juice is extracted. Pare, core and cut the apples into thick slices. Put them into a preserving pan, strain the juice, add the rest of the sugar, and boil gently from 45 to 50 minutes. Pour into jars, cover closely, and store in a dry, cool place. Requires altogether, about 14 hours.

**Apple Jelly.**—Apples, 10 lb.; water, 10 pt.; to each pint of liquid obtained from these allow 1 lb. of sugar and the juice

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of 2 lemons. Rub the apples well with a dry cloth, but do not pare them. Cut them into quarters, remove the cores, and put them into a preserving pan with the sugar. Simmer until perfectly soft, but not broken, then strain off the liquid without squeezing the pulp. If not clear, pass through a jelly bag or clean dry cloth until it becomes so. Add sugar and lemon juice in the proportion stated above, and simmer gently until a little, poured on a cold plate, almost immediately begins to stiffen. Pour into pots or glasses, cover closely, and store in a cool, dry place. Requires from 25 to 30 minutes, after straining. The apple pulp may be sweetened, flavored with ginger or cinnamon, and made into jam.

**Apple Marmalade.**—Apples, 2 lb.; sugar, 4 oz.; butter, 1 oz. Peel, core and quarter the apples, place them in a jar with the sugar and butter, and stand the jar in a saucepan containing boiling water, or, when more convenient, in a cool oven. Cook until soft, pass through a fine sieve, and use for filling turnovers, or other kinds of pastry. Requires 1½ hours.

**Apricot Jam or Marmalade.**—Equal weight of firm, ripe apricots and fine preserving sugar. Skin the apricots carefully, break them in halves and remove the stones. Weigh the fruit, and allow an equal amount of sugar. Pile the apricots on a large dish, sprinkle each layer with sugar, let them stand for 12 hours, and meanwhile remove the kernels from the stones and blanch them. When ready, place the fruit, sugar and kernels in a preserving pan, simmer very gently, skimming meanwhile, and as the pieces of apricot become clear remove them from the syrup and place them at once in the pots. Pour on the syrup and kernels, cover with pieces of paper dipped in salad oil, and stretch over the tops of the jars tissue paper brushed over with white of egg. When dry, the cover will be perfectly hard and airtight. Requires 12 hours, sprinkled with sugar.

**Blackberry Jam.**—Blackberries, half their weight in sugar. Boil the blackberries and sugar together for 40 minutes. Cover closely, and keep in a dry, cool place. The jam will be less insipid if a little lemon juice is added. Requires 40 minutes.

**Blackberry Jelly.**—Make the same as currant jelly.

**Brandied Fruits.**—There seems to be a limited demand for brandied fruits, but lack of space forbids the inclusion of receipts in this book. In the Scientific

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American, Nos. 896 and 897, will be found some very good receipts.

**Cherries.**—The sour cherries, such as Early Richmond and Montmorency, are best for this preserve. Remove the stems and stones from the cherries and proceed as for strawberry preserve.

**Cherry Jam.**—Sound, ripe cooking cherries, an equal quantity of preserving sugar; to each pound of fruit allow ¼ pt. of red currant juice or water, or the two mixed in any proportion that may be convenient. Remove the stones, keeping the cherries as whole as possible, and preserve the kernels. Put the red currant juice or water into a preserving pan with the sugar, and boil to a syrup. Add the cherries and kernels, and simmer gently until the cherries are tender, but not broken, and the juice jellies almost immediately when a little is poured on a cold plate. Pour into jars, cover with paper dipped in brandy, and stretch over the top tissue paper brushed over with white of egg. Store in a cool, dry place. Requires about 1 hour.

**Cherries, Preserved.**—1.—Sound, ripe cooking cherries; to each pound allow ½ lb. of preserving sugar and ¼ pt. of water. Remove the stones carefully, keeping the fruit as whole as possible. Boil the sugar and water to a syrup, add the cherries, simmer them gently for 15 minutes, then turn both fruit and syrup into a large basin and put aside until the following day. Strain the syrup into a preserving pan; to each pint add from 4 to 6 oz. of sugar, according to taste, bring to boiling point, skim well, then put in the fruit and simmer gently for about 10 minutes. Pour into jars, cover at once with paper dipped in brandy, stretch tissue paper, brushed over with white of egg, on the top, and fasten down securely. Store in a cool, dry place. Requires altogether about 26 hours. The flavor may be considerably improved by substituting the juice of either red or white currants for the water.

2.—Cherries Preserved with Currant Juice.—Cherries, 12 qt.; currants, 3 qt.; sugar, 2 qt. Put the currants in the preserving kettle and on the fire. When they boil up, crush them, and strain through cheese cloth, pressing out all the juice. Stem and stone the cherries, being careful to save all the juice. Put the cherries, fruit juice and sugar in the preserving kettle. Heat to the boiling point and skim carefully. Boil for 20 minutes. Put in sterilized jars or tumblers. This gives an acid preserve. The sugar may be doubled if richer preserves are desired.

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**Cider, Boiled.**—When the apple crop is abundant, and a large quantity of cider is made, the housekeeper will find it to her advantage to put up a generous supply of boiled cider. Such cider greatly improves mince meat, and can be used at any time of the year to make cider apple sauce. It is also a good selling article. The cider for boiling must be perfectly fresh and sweet. Put it in a large, open preserving kettle, and boil until it is reduced one-half. Skim frequently while boiling. Do not have the kettle more than two-thirds full. Put in bottles or stone jugs.

**Cider Apple Sauce.**—Boiled cider, 5 qt.; sweet apples, pared, quartered and cored, 8 qt. Put the fruit in a large preserving kettle and cover with the boiled cider. Cook slowly until the apples are clear and tender. To prevent burning, place the kettle on an iron tripod or ring. It will require from 2 to 3 hours to cook the apples. If you find it necessary to stir the sauce, be careful to break the apples as little as possible. When the sauce is cooked put in sterilized jars. In the late spring, when cooking apples have lost much of their flavor and acidity, an appetizing sauce may be made by stewing them with diluted boiled cider, using 1 cupful of cider to 3 cupfuls of water.

**Cider Pear Sauce.**—Cooking pears may be preserved in boiled cider the same as sweet apples. If one prefers the sauce less sour, 1 pt. of sugar may be added to each quart of boiled cider.

**Crab Apple Jelly.**—Crab apples (Siberian crabs), 4 lb.; water, 4 pt.; cloves, 6; ginger, 1 in.; sugar, 1 lb., to each pint of strained liquid. Halve the crab apples with a silver knife. Place them in the water, add the cloves and ginger, simmer until tender, then drain well, but do not squeeze the apples. Replace the drained liquid in the pan, add the sugar, boil until the syrup jellies quickly when tested on a cold plate, then pour into small jars or glasses. Cover securely with parchment, and store in a cool, dry place.

**Currant Jam, Black.**—To each pound of fruit allow 1 lb. of loaf sugar and  $\frac{1}{4}$  pt. of water. Remove the fruit, which should be ripe and perfectly dry, from the stalks, put it into a preserving pan with the water, bring to boiling point, and simmer gently for 20 minutes; add the sugar, and boil for about  $\frac{1}{2}$  hour from the time the jam reboils, or until a little almost immediately sets when tested on a cold plate. Toward the end of the process the jam must be stirred almost continuously, to prevent it boiling over or sticking to

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the bottom of the pan. Pour into pots, at once cover closely, and store in a cool, dry place. Requires from 50 to 60 minutes.

**Currant Jam, Red.**—Red currants, preserving sugar. Remove the stalks, put the fruit into a preserving pan, and to each pound allow  $\frac{3}{4}$  lb. of preserving sugar. Stir occasionally until the fruit is nearly boiling, and afterward almost continuously. Boil gently for about 40 minutes, or until a little will set when poured on to a cold plate. Turn into pots, cover closely, and store in a cool, dry place. Requires about 1 hour.

**Currant Jelly.**—1.—The simplest method of making currant jelly is perhaps the following: Free the currants from leaves and large stems, put them in the preserving kettle, crush a few with a wooden vegetable masher or spoon, and heat slowly, stirring frequently. When the currants are hot, crush them with the vegetable masher. Put a hair sieve or strainer over a large bowl; over this spread a double square of cheese cloth. Turn the crushed fruit and juice into the cheese cloth and let it drain as long as it drips, but do not use pressure. To hasten the process take the corners of the straining cloth firmly in the hands and lift from the sieve; move the contents by raising one side of the cloth and then the other. After this put the cloth over another bowl, twist the ends together, and press out as much juice as possible. This juice may be used to make a second quality of jelly. The clear juice may be made into jelly at once, or it may be strained through a flannel bag. In any case, the method of making the jelly is the same. Measure the juice, and put it in a clean preserving kettle. For every pint of juice add 1 pt. of granulated sugar. Stir until the sugar is dissolved, then place over the fire; watch closely, and when it boils up draw it back and skim; put over the fire again, and boil and skim once more; boil and skim a third time, then pour into hot glasses taken from the pan of water on the stove, and set on a board. Place the board near a sunny window in a room where there is no dust. It is a great protection and advantage to have sheets of glass to lay on top of the tumblers. As soon as the jelly is set cover by one of the three methods given.

2.—To make very transparent currant jelly, heat, crush and strain the currants as directed in the simplest process. Put the strained juice in the flannel bag and let it drain through. Measure the juice

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and sugar, pint for pint, and finish as directed above.

3.—To make currant jelly by the cold process, follow the first rule for jelly as far as dissolving the sugar in the strained juice. Fill warm, sterilized glasses with this. Place the glasses on a board, and put the board by a sunny window. Cover with sheets of glass, and keep by the window until the jelly is set. The jelly will be more transparent if the juice is strained through a flannel bag. Jelly made by the cold process is more delicate than that made by boiling, but it does not keep quite so well.

**Damsons, Bottled.**—Damsons, sugar. Remove the stalks, but not the stones; place the fruit in wide-necked glass bottles, and tie a piece of bladder securely over the top of each one. Cover the bottom of a large boiling pot with a thin layer of straw, stand the bottles side by side on top of it, and surround them with cold water. Bring slowly to boiling point, then remove the boiling pot from the fire, but let the bottles remain in it until the contents are perfectly cold. Before storing them remove the bladder, fill the mouths of the bottles with sugar, and cork with tight-fitting corks. Cover with melted wax, and store in a cool, dry place. Requires altogether about 12 hours.

**Damson Jam.**—To each pound of fruit allow from  $\frac{3}{4}$  lb. to 1 lb. of preserving sugar, according to taste. Remove the stalks, put the fruit and sugar into a preserving pan, let it stand by the side of the fire until some of the juice is extracted, then bring slowly to boiling point, occasionally stirring meanwhile. Boil gently for about 45 minutes, or until the syrup, when tested on a cold plate, stiffens readily. Pour into pots. Cover with paper brushed over with white of egg. Requires about  $1\frac{1}{4}$  hours.

**Damson Jelly.**—Damsons, preserving sugar. The fruit must be firm, dry and ripe. Remove the stalks, put the fruit into a large jar or stewpot, cover closely, place it in a boiling pot of cold water, and cook very slowly until the plums are perfectly tender. Strain the juice through a jelly bag, or fine cloth, into a preserving pan, add from 8 to 10 oz. of sugar to each pint of juice, and boil until the jelly sets quickly when tested on a cold plate. Pour into pots, cover closely with paper brushed over with white of egg, and fasten securely, so as to exclude the air. Store in a cool, dry place. Requires altogether from 6 to 7 hours.

**Damsons (or any Plums), Preserved.**—Let the damsons, or other plums, be

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dry and sound. Place in wide-necked jars, cover completely with boiling water, and pour over a good layer of melted mutton suet. Cover with parchment to completely exclude the air. The fruit will keep a considerable time, and when required for use the water should be poured off and the jelly at the bottom of the jar used to improve the flavor of the fruit.

**Figs, Preserved.**—Green figs. To each pound allow 1 lb. of sugar and  $\frac{1}{2}$  pt. of water, brine that will float an egg. Make a slit across the top of each fig, cover them with brine, and let them remain for 8 days. Drain well, boil gently in a little water until quite tender, then drain again and cover with cold water. Change the water daily for 3 days, and on the third day have ready a syrup made of the sugar and water in the proportions given above. Boil the figs in the syrup for 10 minutes, repeat the process daily for 3 or 4 days, until the figs are tender and green. Place them in jars or bottles, add the syrup, cover closely, and store in a dry, cool place.

**Ginger, Green, Preserved.**—Put the green ginger regularly, every night and morning for a fortnight, into fresh boiling water. Remove the outside skin with a sharp knife, boil it in water until it is quite soft, and slice it in thin slices. Make ready a syrup of 1 lb. of loaf sugar to  $\frac{1}{2}$  pt. of water, clarify it, and put the ginger into it. Boil until it is clear. Requires 14 days.

**Gooseberries, Bottled.**—Head and tail firm, sound, unripe green gooseberries, put them into wide-necked glass bottles, and wrap a little hay or straw around each bottle. Put a thin layer of the same on the bottom of a large boiling pot, stand the bottles on the top of it, and surround them to at least three-quarters of their depth with cold water. Bring the water slowly to boiling point, then remove the pan from the fire, but allow the bottles to remain in it until the gooseberries begin to rise in them. Now add to each one a little boiling water, cork with new corks, and cover the bottles with bladder. Place them on their sides, in a cool, dry place. When using the fruit, sugar or syrup must be added, according to taste. Requires altogether about 1 hour.

**Gooseberry Jam.**—Equal weights of green gooseberries and preserving sugar. To 7 lb. of fruit allow 1 pt. of cold water. Head and tail the gooseberries. Put the sugar and water into a preserving pan, let it stand by the side of the fire until the sugar is dissolved, then add the

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fruit. Bring slowly to boiling point, stirring occasionally, then boil slowly until the syrup readily stiffens when tested on a cold plate; this will be when the jam has boiled for about 40 minutes. Pour the jam into jars, cover it at once with paper brushed over with white of egg, and keep it in a cool, dry place. Requires about 1½ hours.

*Gooseberry and Currant Jam.*—Gooseberries, red hairy, 6 lb.; preserving sugar, 4 lb.; currant juice (see red currant jelly), ½ pt. Head and tail the gooseberries, put them into a preserving pan, and allow them to stand by the side of the fire until some of the juice is extracted. Bring to boiling point; when the gooseberries have boiled for 10 minutes add the sugar gradually, put in the red currant juice, and boil until the jam sets when tested on a cold plate. The scum must be removed as it rises, and the jam should be well stirred toward the end of the boiling process. When ready, pour into pots, cover closely, and store in a cool, dry place. Requires from 1½ to 2 hours.

*Gooseberry Jelly.*—To each pint of gooseberries allow ½ pt. of water; to each pint of juice obtained from these add 1 lb. of either loaf or preserving sugar. Put the fruit and water into a preserving pan, and boil slowly until reduced to a pulp. Strain through a jelly bag of fine cloth until clear, then put it into the preserving pan with the sugar, and boil until it will set when a little is poured on a cold plate. Turn into small pots, cover with paper brushed over with white of egg, fasten securely down, so as to completely exclude the air, and store the jelly in a cool, dry place. Requires about 2 hours.

*Grape Jam.*—Firm, sound, unripe grapes. To each pound allow ½ lb. of preserving sugar. Place the fruit and sugar in layers in a preserving pan, allow to stand by the side of the fire until the whole mass is thoroughly hot and some of the juice is extracted, then bring slowly to boiling point. Boil until the juice sets quickly when tested on a cold plate, pour it into small pots, cover closely, and keep the jelly in a cool, dry place. Requires about 1 hour.

*Grape Jelly.*—1.—Ripe.—An acid grape is best for this jelly. The sweet, ripe grapes contain too much sugar. Half-ripe fruit, or equal portions of nearly ripe and green grapes will also be found satisfactory. Wild grapes make delicious jelly. Make the same as currant jelly.

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2.—Green.—Make the same as apple jelly.

*Grape Marmalade.*—Remove the stalks, put the fruit into a preserving pan, barely cover with boiling water, and simmer gently until perfectly soft, but the grapes must not be allowed to break. Drain well, pass through a fine sieve, and return the pulp to the pan. To each pint add from 12 to 16 oz. of sugar, according to the degree of sweetness required, and boil from 20 to 25 minutes, reckoning from the time the entire mass reaches boiling point. Turn into jars, cover at once with paper brushed over on both sides with white of egg, and store in a cool, dry place. Requires about 1 hour.

*Greengages Jam.*—Firm, sound greengages. To each pound allow ¾ lb. of preserving sugar. Remove the stalks and stones, crack a few of the latter, and put the kernels aside. Cover the bottom of a preserving pan to the depth of ½ in. with cold water, put in the fruit and kernels, bring slowly to boiling point, and boil gently for 15 minutes. Meanwhile, the sugar should have been placed in the oven in a deep tin or dish, and allowed to become thoroughly hot. It may now be added gradually to the fruit, and the boiling must be continued until the jam sets quickly when tested on a cold plate. Pour into pots, cover with paper brushed over with white of egg, and store in a cool, dry place. Requires from 1 to 1½ hours.

*Greengages Preserved in Syrup.*—To each pound of fruit allow 1 lb. of either loaf or preserving sugar and ¼ pt. of water. Proceed exactly as in the preceding recipe, with the exception of removing the stones before putting the fruit into the syrup. Boil the fruit for 10 minutes on 3 consecutive days, adding on the last day half the kernels, which should be previously blanched. Throughout the whole process the scum must be carefully removed as it rises, otherwise the syrup will not be clear. Requires altogether 3 days.

*Lemon Marmalade.*—Place the lemons in a preserving pan, cover them with cold water, and boil them gently for 2 hours, during which time the water must be drained off and replaced by fresh boiling water at least 3 times. Let them cool slightly, slice thinly, remove all the pips, and weigh the fruit. To each pound allow 2 lb. of loaf sugar and 1 pt. of the water the lemons were last boiled in, and boil these together until a thin syrup is obtained. Then add the prepared fruit, and boil until the marmalade jellies when-

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tested on a cold plate. Cover closely with paper brushed over on both sides with white of egg, and store in a cool, dry place. Requires from 3 to 3½ hours.

**Mangoes, To Preserve.**—Let the mangoes lie for a few hours in cold water, then peel them thinly and remove the stones. Cover with weak lime water, and at the end of 1 hour drain well and place them in a preserving pan. Barely cover with cold water, boil gently for 10 minutes, and drain well. Replace the mangoes in the pan, cover with syrup, boil gently until the sugar begins to crystallize, and when cool transfer carefully into jars or wide-necked bottles. During the first month the syrup must be examined from time to time, and if it appears at all thin it should be reboiled. It may be necessary to repeat this process two or three times before finally corking down.

**Nectarines, Preserved.**—Split the nectarines in halves, remove the stones, crack them, and put the kernels aside. Weigh the fruit, put an equal amount of sugar into the preserving pan, add ¼ pt. of water to each pound of sugar, and boil to a syrup. Now put in the fruit, boil very gently until it is quite tender, but not broken, then lift it out carefully with a spoon and put it into pots. Boil the syrup rapidly until it sets quickly when tested on a cold plate, pour it over the fruit, cover closely, and store in a cool, dry place. Requires about 1½ hours.

**Orange Marmalade.**—1.—Oranges, 12; lemons, 2; preserving sugar. Slice the fruit thinly, removing inner pith and pips. Weigh it, and to each pound add 3 pt. of cold water. Let the whole remain covered in an earthenware vessel for 3 days, then turn the preparation into a preserving pan and boil gently until quite tender. Let it cool, weigh again, and to each pound of fruit add 1 lb. of sugar. Bring to boiling point, skim well, and cook gently until the syrup stiffens quickly when tested on a cold plate. Turn into pots, cover with paper brushed over on both sides with white of egg, and store in a cool, dry place. Requires altogether 1 day.

2.—Grated Marmalade.—Large Seville oranges, 12; lemons, 2; sugar. Grate the rinds of 6 oranges, remove all the white pith and throw it away. Remove and throw away both rind and pith of the remaining 6 oranges. Weigh the oranges, and to each pound allow 1 lb. of sugar. Divide into sections, scrape out the pulp, and soak the pips and pith in a little cold water. Place the sugar, juice of the 2 lemons, orange rind, pulp and

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juice in a preserving pan, add the water strained from the pips and pith, and boil gently until the marmalade jellies quickly when tested on a cold plate. Cover the jars closely, and store them in a dry, cool place.

3.—Made with Honey.—Boil the rinds until tender, then shred them finely. Remove the pith and pips, measure the pulp, and to each pint allow 1 lb. of honey and ½ lb. of the prepared rinds. Simmer gently for about 40 minutes, stirring frequently, then turn the marmalade into jars or glasses, and cover these with parchment. Store in a cool, dry place.

**Pears, Preserved.**—Firm, sound, not overripe pears, an equal weight of loaf sugar. Pare, halve and core the pears. Put half the sugar into a preserving pan, to each pound add 2 pt. of water, and boil to a thin syrup. Let it cool, put in the prepared fruit, and simmer very gently until half cooked. Turn the whole into an earthenware bowl, cover, and allow them to remain for 8 days. When ready, drain the syrup into a preserving pan, add the remainder of the sugar and a tablespoonful of lemon juice to each pint of liquid, and boil gently for 15 minutes, skimming well meanwhile. Now put in the fruit, simmer very gently until quite tender, then transfer them carefully to jars, and pour over the syrup. Cover closely and store in a cool, dry place. Requires altogether 2 days.

**Pears, Sweet Pickled.**—Firm pears. To each pound allow ½ lb. of brown sugar and ¼ pt. of malt vinegar; cloves, cinnamon, all spice. Peel the pears, and tie the spices in muslin. Place the vinegar, sugar and spices in a preserving pan; when boiling, add the pears, and cook them gently until tender. Remove the pears to a bowl or large basin, boil the syrup for 10 minutes longer, then pour it over the fruit. On the following day boil up the syrup, and repeat the process the two following days. On the third day place the pears in jars or wide-necked bottles, and remove the spices before adding the vinegar to the fruit. Store in a dry, cool place. Requires 3 days.

**Pineapple Marmalade.**—To each pound of pineapple pulp add 14 oz. of loaf sugar. Peel, core and slice the pineapples, and either pound or grate them finely, preferably the latter. Boil the pulp and sugar together until thick and clear, then turn into pots, cover first with branded paper, and afterward with parchment. Store in a cool, dry place. Requires 2 to 3 hours.

**Pineapples, Preserved.**—Pineapples;

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pounded loaf or castor sugar. Pare and slice the fruit thinly, pile it on a large dish, and sprinkle each layer liberally with sugar. Keep it in a hot closet, or put it daily for 7 or 8 days into a cool oven, turning it frequently. When quite dry, bake a few slices at a time in a moderately hot oven. When quite cold, pack them in airtight boxes, with paper between each layer. Requires about 8 days.

**Plum Jam.**—To each pound of plums allow from 12 to 16 oz. of sugar, according to the degree of sweetness required, and the amount of acidity contained in the plums. Divide the plums, take out the stones, or, if preferred, cut them across and remove the stones as they rise in the pan. Pile the fruit on a large dish, with the sugar spread thickly between each layer; allow them to remain thus until the following day, then put the whole into a preserving pan, and heat slowly by the side of the fire, stirring occasionally meanwhile. Boil gently until the jam sets quickly when tested on a cold plate, then turn it into pots, cover closely, and keep it in a cool, dry place. Requires altogether 26 hours.

**Plum Jelly.**—Use an underripe acid plum. Wash the fruit and remove the stems. Put into the preserving kettle with 1 qt. of water for each peck of fruit. Cook gently until the plums are boiled to pieces. Strain the juice and proceed the same as for currant jelly.

**Plums, To Preserve.**—1.—To each pound of plums allow 1 lb. of loaf sugar and  $\frac{1}{2}$  pt. of water. Put the water and sugar into a preserving pan, and boil to a thin syrup. Remove the stalks from the plums, prick them slightly to prevent them breaking, pour over them the prepared syrup, and allow them to remain thus for 2 days. Turn the whole into a preserving pan, boil very gently until the plums are tender, then lift them carefully into pots. Boil the syrup to the "large thread" degree, pour it over the plums, cover closely, and store them in a cool, dry place. Requires altogether 2 days.

2.—Greengages, 4 qt.; sugar, 2 qt.; water, 1 pt. Prick the fruit and put it in a preserving kettle. Cover generously with cold water. Heat to the boiling point, and boil gently for 5 minutes. Drain well. Put the sugar and water in a preserving kettle, and stir over the fire until the sugar is dissolved. Boil 5 minutes, skimming well. Put the drained greengages in this syrup, and cook gently for 20 minutes. Put in sterilized jars. Other plums may be preserved in the same

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manner. The skins should be removed from white plums.

**Plums, Spiced.**—Prick the plums well with a fork, place them in a large jar, with cinnamon, cloves and orange rind between each layer. Cover with vinegar, and on the following day strain off and boil for 10 minutes. Let it cool, pour it over the fruit, and at the end of 24 hours again strain and measure it. To each pint add 3 oz. of sugar, boil the two together for 10 minutes, pour it over the plums, and when cold cover closely, and store in a dry, cool place. Requires 3 days.

**Plums.**—(See also *Damsons; Greengages.*)

**Quince Jelly.**—Rub the quinces with a coarse crash towel; cut out the blossom end. Wash the fruit, and pare it and cut in quarters. Cut out the cores, putting them in a dish by themselves. Have a large bowl half full of water; drop the perfect pieces of fruit into this bowl. Put the parings and imperfect parts, cut very fine, into the preserving kettle. Add 1 qt. of water to every 2 qt. of fruit and parings. Put on the fire and cook gently for 2 hours. Strain, and finish the same as apple jelly. The perfect fruit may be preserved or canned. To make quince jelly of a second quality, when the parings and fruit are put on to cook, put the cores into another kettle and cover them generously with water, and cook 2 hours. After all the juice has been drained from the parings and fruit put what remains into the preserving kettle with the cores. Mix well, and turn into the straining cloth. Press all the juice possible from this mixture. Put the juice in the preserving kettle with 1 pt. of sugar to 1 pt. of juice; boil 10 minutes.

**Quince Marmalade.**—To each pound of quince pulp allow  $\frac{3}{4}$  lb. of loaf or preserving sugar. Pare the fruit, put it into a preserving pan with as much water as will just cover the bottom of the pan, and stew gently until reduced to a pulp. Pass through a hair sieve, weigh the pulp, replace it in the pan, add the sugar, and cook very gently until the marmalade sets quickly when tested on a cold plate. Turn into pots, cover with paper brushed over on both sides with white of egg, and store in a cool, dry place. Requires about 4 hours.

**Quinces, Preserved.**—Pare, quarter and core the quinces, and preserve the skins and cores. Put the fruit into the preserving pan with barely enough water to cover them, and simmer until soft, but not broken. Place the quinces singly on



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large dishes, add the cores and parings to the water in which the quinces were cooked, and simmer gently for 1 hour. Strain through a jelly bag until quite clear, return it to the pan with the addition of 1 lb. of loaf sugar for each pound of fruit, bring to boiling point, and skim well. Put in the quinces, boil for 15 minutes, then turn the whole carefully into an earthenware bowl, and let the preparation remain until the following day. Drain the syrup once more into the pan; when boiling add the fruit, cook gently for 15 minutes, then lift the quinces carefully into small jars, which they should three-quarters fill. Continue boiling the syrup until it forms a thick jelly when tested on a cold plate, pour it over the fruit, cover the jars closely with paper brushed over on each side with white of egg, and store in a cool, dry place. Requires altogether 2 days.

**Raspberry Jam.**—To every pound of raspberries allow 1 lb. of sugar and  $\frac{1}{4}$  pt. of red-currant juice. Let the fruit for this preserve be gathered in fine weather, and used as soon after it is picked as possible. Take off the stalks, put the raspberries into a preserving pan, break them well with a wooden spoon, and let them boil for  $\frac{1}{4}$  hour, keeping them well stirred; add the currant juice and sugar, and boil again for  $\frac{1}{2}$  hour. Skim the jam well after the sugar is added, or the preserve will not be clear. The addition of the currant juice is a very great improvement to this preserve, as it gives it the piquant taste which the flavor of the raspberries seems to require. Requires about 1 hour.

**Raspberry and Currant Jelly.**—Make the same as currant jelly, using half currants and half raspberries.

**Rhubarb Jam.**—To each pound of rhubarb allow 1 lb. of preserving sugar,  $\frac{1}{2}$  teaspoonful of ground ginger and the finely grated rind of  $\frac{1}{2}$  lemon. Remove the outer stringy part of the rhubarb, cut it into short lengths, and weigh it. Put it into a preserving pan with sugar, ginger and lemon rind in the above proportions, place the pan by the side of the fire, and let the contents come very slowly to boiling point, stirring occasionally meanwhile. Boil until the jam sets quickly when tested on a cold plate. Pour it into pots, cover closely, and store in a cool, dry place. Requires from 1 to  $1\frac{1}{2}$  hours, according to the age of the rhubarb.

**Rhubarb and Orange Jam.**—Finely cut rhubarb, 1 qt.; oranges, 6; preserving sugar,  $1\frac{1}{2}$  lb. Cut the rinds of the or-

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anges into sections, remove them, and scrape off as much of the white pith as possible. Free the pulp from fibrous skin and pips, put it into a preserving pan with the sugar, rhubarb and orange rinds, previously finely shredded. Bring slowly to boiling point, skim well, and boil until the jam stiffens when tested on a cold plate. Cover closely, and store in a cool, dry place. Requires about 1 hour.

**Rhubarb Marmalade.**—To each pound of rhubarb allow 2 tablespoonfuls of sugar and  $\frac{1}{4}$  teaspoonful of ground ginger. Wipe, string, and cut the rhubarb into short lengths. Put the rhubarb, sugar and ginger in a jar, place the jar in a rather cool oven, or in a saucepan containing boiling water, and cook until soft. Pass through a fine sieve, and use for filling turnovers and similar kinds of pastry. Requires  $1\frac{1}{2}$  hours.

**Strawberry Jam.**—To each pound of fruit allow from 12 to 16 oz. of preserving sugar. Remove the stalks from the fruit, put it into a preserving pan, covering each layer thickly with sugar. Place the pan by the side of the fire, bring the contents slowly to boiling point, and stir occasionally. Skim well, boil gently until the jam sets when tested on a cold plate, taking care in stirring to keep the fruit as whole as possible. Pour into pots, cover with paper brushed over on both sides with white of egg, and keep in a cool, dry place. Requires about 1 hour.

**Strawberry Jelly.**—To 10 qt. of strawberries add 2 qt. of currants, and proceed as for currant jelly, but boil 15 minutes.

**Strawberries, Preserved.**—1.—An equal weight of fruit and loaf sugar. Strawberries for preserving must be very dry, otherwise they will not keep; the stalks must be removed, and any unsound fruit rejected. Put the sugar into a preserving pan; to each pound add  $\frac{1}{2}$  pt. of cold water and a small pinch of cream of tartar, and boil to the "small ball" degree. Now put in the prepared fruit, cover the pan, allow it to remain on the stove, but as far away from the fire as possible, for about 1 hour, then bring the contents to boiling point and skim well. Boil gently for 5 minutes, then turn into jars, cover closely, and store in a cool, dry place.

2.—Use equal weights of sugar and strawberries. Put the strawberries in the preserving kettle, in layers, sprinkling sugar over each layer. The fruit and sugar should not be more than 4 in. deep. Place the kettle on the stove, and heat the fruit and sugar slowly to the boiling point. When it begins to boil, skim care-

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fully. Boil 10 minutes, counting from the time the fruit begins to bubble. Pour the cooked fruit into platters, having it about 2 or 3 in. deep. Place the platters in a sunny window, in an unused room, for 3 or 4 days. In that time the fruit will grow plump and firm, and the syrup will thicken almost to a jelly. Put this preserve, cold, into jars or tumblers.

**Tomato Marmalade.**—Ripe tomatoes, 7 lb.; loaf sugar, 8 lb.; lemons, 6; water, 1 pt. Blanch and skin the tomatoes and cut them in halves. Remove the rinds and all the white pith of the lemons, and slice the fruit thinly. Boil the sugar and water to a thin syrup, add the prepared tomatoes and lemons, and bring to boiling point. Stir and skim frequently, and continue to boil gently until the marmalade quickly jellies when tested on a cold plate. Pour into pots or glasses, and store in a cool, dry place. Requires about 1½ hours.

**Tomatoes, Preserved.**—Firm, ripe tomatoes, 7 lb.; sugar, 3½ lb.; cloves, allspice and cinnamon, of each, 1 oz.; vinegar, 1 pt. Scald, drain and peel the tomatoes. Tie the spices in muslin, boil them for 5 minutes, with the sugar, in the vinegar, then add the tomatoes, and simmer very gently for ½ hour. Keep closely covered, in a dry, cool place. Requires ½ hour to cook the tomatoes.

**Wild Fruits for Jellies.**—Wild raspberries, blackberries, barberries, grapes and beach plums all make delicious jellies. The frequent failures in making barberry jelly come from the fruit not being fresh or from being overripe.

### To Preserve Fruit for Exhibition Purposes Only.

The following preservatives are used by the U. S. Department of Agriculture:

1.—Formalin, 1 lb.; water, 44 lb.; alcohol, 5 pt. Allow the mixture to stand, and should there be any sediment, pour off the clear liquid and filter the remainder through filter paper. This 2% solution of formalin has been found very useful for preserving strawberries so as to give them a natural appearance.

2.—Boric acid, 1 lb.; water, 45 lb. Dissolve by agitation, then add 5 pt. of alcohol. If the fluid is not clear, allow to stand and settle, when the clear upper portion may be poured off and the remainder filtered.

3.—Dissolve ½ lb. of zinc chloride in 15 lb. of water. Agitate till dissolved, then add 1 2/3 pt. of alcohol. Allow to stand until settled, then pour off the clear liquid and filter the remainder.

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4.—Sulphurous acid, 1 pt.; water, 8 pt.; alcohol, 1 pt. Allow the mixture to stand, and should there be any sediment pour off the clear liquor and filter the remainder.

5.—List of fruits with number of the preservative. Where two are given either may be used, but the first is preferred:

Strawberries	No. 1	No. 1
Raspberries, red	" 2	" 3
Raspberries, white	" 4	" 3
Raspberries, black	" 2	" 3
Blackberries	" 2	" 1
Cherries, red or black	" 1	" 2
Cherries, white	" 4	" 3
Currants, red	" 1	" 2
Currants, white	" 4	" 3
Currants, black	" 2	" 3
Gooseberries	" 1	" 2
Apples, green and russet	" 3	" 3
Apples, more or less red	" 2	" 3
Apples, white or yellow	" 4	" 3
Pears, russet	" 3	" 3
Pears, green or yellow	" 4	" 3
Plums, dark-colored	" 1	" 2
Plums, green or yellow	" 4	" 3
Peaches, apricots	" 4	" 3
Nectarines or quinces	" 4	" 3
Grapes, red or black	" 1	" 2
Grapes, green or yellow	" 4	" 3

Select the finest specimens of fruit as to form and size. Handle carefully, and place in bottles, arranging them so as to show best. Fill each bottle to the neck with fruit, then pour on the liquid recommended, filling the bottles to within ½ in. of the stopper, so as to entirely cover the fruit. Then place the stopper in the bottle and run a little melted beeswax or paraffine over the joint to make it airtight. Tie the stopper down with a piece of strong cotton. Wrap the bottles in paper, to exclude the light, and preserve in a cellar or other cool place until required for shipment. Strawberries and raspberries should be cut from the plants or bushes with a pair of scissors, leaving a short piece of stem attached to each.

### PICKLES AND CATSUPS

#### Beans, French, Pickled.

Cover young French beans with strong salt and water, let them remain for three days, then drain. Place them in a saucepan with vine leaves under and over, cover with salted boiling water, cook gently for a few minutes, then drain, and pack loosely in jars. Cover with boiling spiced vinegar, drain it off, and reboil on two following days. The pickled beans should

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be kept closely covered in a cool, dry place.

#### **Cabbage, Pickled Red.**

Good, firm red cabbage, 1; vinegar, 1 qt.; whole pepper,  $\frac{1}{2}$  oz.; allspice,  $\frac{1}{2}$  oz. Remove the outer leaves of the cabbage, quarter it, remove the center stalk, and cut each section across into very fine strips. Pile the shredded cabbage on a large dish, sprinkle it liberally with salt, and let it remain thus until the following day. Meanwhile boil the vinegar, pepper and spice together, the latter being tied together in a piece of muslin, and allow the preparation to become quite cold. Turn the cabbage into an earthenware or enameled colander, and when well drained put it into a large jar and pour in the vinegar. It will be fit for use in 3 or 4 days; if kept for any length of time it loses the crispness and color which are its chief recommendations. Requires altogether 2 days.

#### **Catsups.**

*Anchor Catsup.*—Good ale, 1 qt.; anchovies,  $\frac{1}{4}$  lb.; finely chopped shallots, 3; mushroom catsup, 1 tablespoonful; castor sugar,  $\frac{1}{2}$  teaspoonful; ground ginger,  $\frac{1}{2}$  teaspoonful; ground mace,  $\frac{1}{4}$  teaspoonful; cloves, 2. Put all these ingredients into a stewpan, simmer very gently for about 1 hour, and strain. When quite cold, pour the catsup into small bottles, cork them tightly, and store in a cool, dry place.

*Cucumber Catsup.*—1. Pare the cucumbers, slice them as thinly as possible into a basin, and sprinkle them liberally with salt. Let them remain closely covered until the following day, then strain the liquor from the cucumbers into a stewpan, add 1 teaspoonful of peppercorns to each pint, and simmer gently for about  $\frac{1}{2}$  hour. When cold, strain into bottles, cork tightly, and store in a cool, dry place. This catsup imparts an agreeable flavor to sweetbreads, calf's brains, chicken mixtures, and other delicate preparations.

2. Peel ripe cucumbers, grate the fleshy portion, and pass it through a colander or coarse sieve to free it from seeds. To each 3 pt. of the pulp add 2 oz. of salt,  $\frac{1}{2}$  oz. of white pepper in powder, and 1 pt. of vinegar. Macerate for a fortnight, occasionally stirring, and strain.

*Horseradish Catsup.*—Macerate 1 lb. of grated horseradish in 2 pt. of vinegar for a month, and strain.

*Mushroom Catsup.*—Upon a suitable

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quantity of the fresh mushrooms sprinkle salt (about 1 to 4 of the fungi), and after 3 days squeeze out the juice. To every gallon of juice add black pepper, ginger and cloves, of each  $\frac{1}{2}$  oz.; pimento, 2 oz.; mustard seed, 2 oz.; and a sufficient quantity of salt. Boil for 5 minutes and set aside to settle. Strain after 7 days.

*Soy, Indian.*—This sauce is usually bought ready prepared. It is imported from China and Japan, where it is made from a small bean, the produce of *Dolichos Soja*. Japanese soy is usually preferred to that of China, because it is free from the sweet treacly flavor which distinguishes the latter. When well made it has a good brown color, thick consistency, and is clear.

*Soy, Japanese.*—An equal weight of beans, coarse barley meal and salt. Wash the beans well, boil them in water until tender, and pound them in a mortar, adding the barley meal gradually. Put the mass into an earthenware bowl, cover with a cloth, and let it stand in a warm place for several days, until it is sufficiently fermented, but not moldy. To each pound of salt add 4 pt. of water, stir until the salt is dissolved, then stir into the fermented mass. Keep the bowl or pan closely covered for 3 months, during which time it must be daily stirred for at least 1 hour. At the end of this time strain through fine cloths, pressing the insoluble portion well, in order to extract as much of the moisture as possible. Let it stand again until quite clear, then drain off and bottle for use. In making Chinese soy, the liquid extracted is boiled and reboiled with a varying amount of sugar, mace, ginger and pepper until it acquires the desired consistency.

*Tomato Catsup.*—Ripe tomatoes, 3 doz.; chillie vinegar, 1 pt.; garlic, 1 oz.; shallots, 1 oz.; common salt, 2 oz.; cayenne pepper,  $\frac{1}{2}$  dr.; lemon juice, 5 oz. Put the tomatoes into a jar, and warm in an oven until tender. Cool, skin and pulp the fruit, and add to the liquor in the jar, along with the rest of the ingredients. Mix well and bottle.

*Walnut Catsup.*—Crush 10 doz. green walnuts, and to the mass add ground black pepper,  $1\frac{1}{2}$  oz.; ground nutmeg,  $1\frac{1}{2}$  oz.; ground cloves,  $\frac{1}{2}$  oz.; ground ginger,  $\frac{1}{2}$  oz.; ground mace,  $\frac{1}{4}$  oz. Boil the whole in  $\frac{1}{2}$  gal. of vinegar for half an hour, then set aside for a week and strain.

#### **Pickles.**

*Cauliflowers, Pickled.*—Firm white cauliflowers; vinegar to cover them; to each

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quart of which allow 1 teaspoonful of peppercorns, 1 teaspoonful of allspice and 6 cloves. Break the cauliflowers into small sprays, place them on a dish, sprinkle them liberally with salt, and let them remain thus for 6 hours. Meanwhile tie the seasoning ingredients in muslin, boil them in the vinegar for  $\frac{1}{2}$  hour, and allow it to become quite cold. Drain the cauliflowers well from the salt, place them in wide-necked bottles or unglazed jars, and pour the prepared vinegar over them. Cover closely, store in a cool, dry place for about 1 month, and they will then be ready for use. Requires 1 month.

#### *Cauliflowers, Pickled with Onions.*—

An equal weight of cauliflower sprays and silver onions, vinegar to cover. To each quart of vinegar allow 1 level teaspoonful of peppercorns, 1 level teaspoonful of allspice, 1 level teaspoonful of black pepper, 1 blade of mace, 1 oz. of turmeric, 1 tablespoonful of curry powder, 1 tablespoonful of dry mustard, 1 tablespoonful of salt, 1 tablespoonful of lemon juice, 1 tablespoonful of raw lime juice. Put as much water as will cover the sprays of cauliflower into a large saucepan; to each quart add 4 oz. of salt, boil for 10 minutes, and allow it to become quite cold. Break the cauliflowers into small sprays, cover them with the cold brine, let them remain immersed for 3 days, then drain well. Peel the onions, place them in jars or wide-necked bottles in layers, alternating with sprays of cauliflower; sprinkle each layer with a little allspice, a few peppercorns, and 1 or 2 pieces of mace. Mix the black pepper, turmeric, curry powder, mustard and salt, lemon juice and lime juice to a smooth paste, add the vinegar gradually, and pour the whole over the cauliflowers and onions. Cover closely, and store in a cool, dry place. The pickle will be ready for use in 3 or 4 weeks. Requires from 3 to 4 weeks.

*Cherries, Pickled.*—Sound, not over-ripe Kentish cherries; French vinegar to cover them. To each pint of vinegar allow  $\frac{1}{2}$  lb. of sugar, and to the whole add cayenne to taste. A few drops of cochineal or carmine. Pick the cherries carefully, rejecting those which are not quite sound, leave about 1 in. of their stalks, and put the fruit into jars. Boil the vinegar, add to it the sugar and cayenne, skim well, let it boil for a few minutes, then turn it into an earthenware vessel. When cold, add a few drops of carmine or cochineal, pour it over the cherries, cover closely, and store in a cool, dry place. Requires from 3 to 4 hours.

*Chutney, English.*—Sour apples, 3 doz. ;

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coarse brown sugar, 3 lb.; salt,  $\frac{1}{2}$  lb.; sultana raisins, 2 lb.; green ginger,  $\frac{1}{2}$  lb.; bird's-eye chillies, 6 oz.; mustard seed, 2 oz.; medium-sized Spanish onions, 5; shallots, 6; good malt vinegar, 3 qt.

*Chutney, Indian.*—Malt vinegar, 1 qt.; sour apples, 1 lb.; sour apples, peeled, cored and sliced, 1 lb.; onions, peeled and coarsely chopped,  $\frac{1}{2}$  lb.; moist sugar, 1 lb.; raisins, stoned and quartered,  $\frac{1}{2}$  lb.; salt, 4 oz.; ground ginger, 4 oz.; dry mustard, 2 oz.; cayenne,  $\frac{1}{4}$  oz.; 4 cloves of garlic finely chopped. Cook the apples, onions and garlic with the salt, sugar and vinegar until quite soft, and pass them through a fine hair sieve. Add the raisins, ginger, cayenne and mustard, mix well together, turn into a jar, and stand it in a warm, but not hot place, until the following day. Have ready some perfectly dry, wide-necked small bottles or jars, fill them with chutney, and cover closely so as to exclude the air. This chutney may be kept for a year or two.

*Chutney Mango.*—Green mangoes, 50; vinegar, 6 pt.; sugar, 3 lb.; tamarinds, stoned, 2 lb.; raisins, stoned, 1 lb.; green ginger, sliced, 1 lb.; powdered cinnamon, 1 good teaspoonful; nutmeg, 1 level teaspoonful; salt, 1 lb. Peel and slice the mangoes thinly, sprinkle over them the salt, let them remain for 36 hours, then drain well. Make a syrup by boiling together 3 pt. of vinegar and the sugar. Put the remainder of the vinegar into a preserving pan, add the mangoes, boil up, simmer gently for 10 minutes, then add the tamarinds, raisins, ginger, cinnamon and nutmeg. Cook very slowly for  $\frac{1}{2}$  hour, adding the syrup gradually during the last 10 minutes. Stir and boil the mixture until the greater part of the syrup is absorbed, then turn into bottles, cork securely, and store in a dry place. Requires about  $1\frac{1}{2}$  hours to cook.

*Cucumbers, Pickled.*—Cucumbers; good vinegar to cover them. To each pint of vinegar allow  $\frac{1}{2}$  oz. of peppercorns,  $\frac{1}{2}$  oz. of allspice,  $\frac{1}{2}$  teaspoonful of salt. Peel the cucumbers, cut them into  $\frac{1}{2}$ -in. slices, sprinkle them liberally with salt, and let them remain until the following day. Let the cucumbers drain for at least 2 hours on a hair sieve, then place in wide-necked glass bottles. Boil the vinegar, salt, peppercorns and spice together, pour it, while hot, over the cucumbers, and cover closely. If stored in a cool, dry place, this pickle will keep good for some time; but as it is liable to become moldy, the bottles should be frequently examined. When the first speck of mold appears reboil the vinegar.

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immerse the slices of cucumber in it for 1 minute, then put them into a clean, dry bottle, and pour the boiling vinegar over them. Requires 2 days.

**Cucumbers, Preserved.**—Pare and slice the cucumbers thinly, sprinkle liberally with salt, and let them remain until the following day. Drain off the liquor, pack the slices closely in jars, sprinkling each layer thickly with salt, and cover with parchment paper, or paper coated on both sides with white of egg. When wanted for use, wash well in cold water, drain well, and dress with pepper, vinegar and oil. Requires 24 hours.

**Gherkins, Pickled.**—To each quart of vinegar allow  $\frac{1}{4}$  oz. of allspice,  $\frac{1}{4}$  oz. of black peppercorns, 4 cloves, 2 blades of mace. Cover the gherkins with salt and water, and let them remain in the brine for 3 days. At the end of the time drain them well, dry them with a cloth, and pack them compactly in a jar of suitable size. Boil sufficient vinegar to cover them, with peppercorns and spices in the above proportions, for 10 minutes, and pour the liquid over the vinegar, simmer very gently for 10 minutes longer, and when quite cold pour into small bottles. Cork securely, cover the corks with melted wax, and store for use, in a cool, dry place.

**Horseradish, To Bottle.**—Horseradish, scraped or grated, 6 tablespoonfuls; white sugar, 1 tablespoonful; vinegar, 1 qt. Scald the vinegar, and pour, boiling hot, over the horseradish. Steep a week, strain, and bottle. Exposure to the air will discolor.

**Horseradish, Pickled.**—Scrape the outer skin off the horseradish, cut it into  $\frac{1}{2}$ -in. lengths, and place them in wide-necked bottles or small unglazed jars. Cover with good malt vinegar, cork the bottles tightly, or fasten parchment paper securely over the tops of the jars. Keep the pickle in a cool, dry place.

**Lemon Pickle.**—Lemons, 12; baysalt, 1 lb.; mustard seed, tied in muslin, 4 oz.; peeled garlic, 2 oz.; grated nutmeg,  $\frac{1}{2}$  oz.; ground mace,  $\frac{1}{2}$  oz.; ground cloves,  $\frac{1}{4}$  oz.; white-wine vinegar, 1 qt. Remove the rinds of the lemons in thin slices, and put them aside, to be afterward dried and used for flavoring purposes. Leave all the pith on the lemons, cut them lengthwise and across, thus forming four quarters, sprinkle over them the salt, and place them singly on a large dish. Let the dish remain near the fire until all the juice of the lemons has dried into the pith, then put them into a large jar. Add the rest of the ingredients, cover closely,

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and let it stand near the fire, but not on the stove, for 5 days. At the end of the time cover the lid with parchment paper or bladder, and put the jar in a cool, dry place. At the end of 3 months strain off the vinegar through a hair sieve and press the fruit well to extract as much moisture as possible. Strain 2 or 3 times, and when quite clear bottle for use.

**Limes, Pickled.**—Limes, 25; salt, 4 oz.; green chillies, 4 oz.; green ginger, 4 oz.; mustard seed freed from husks, 2 oz.; ground turmeric, 1 oz.; good vinegar,  $1\frac{1}{2}$  pt. Cut the limes across in halves, squeeze out all the juice, add 2 oz. of salt, and cover closely. Sprinkle the remaining salt over the rinds, let them remain for 6 hours, then dry them in the sun for 3 days, or until hard. Boil the chillies, green ginger, mustard seed and turmeric in the vinegar for 20 minutes. Let the preparation cool, mix it with the lime juice, and strain it over the lime rinds, previously laid compactly in wide-necked bottles or jars. Cover closely, place them in the sun for 3 or 4 days, then store for use. Requires 5 days.

**Melons, Pickled.**—Small melons, small French beans, grated horseradish, cloves, ground nutmeg, cinnamon, pepper, vinegar, and to each quart add 1 teaspoonful each of cloves, allspice and black peppercorns. Cut off one end, scoop out the inside of each melon, then replace and secure the end. Cover the melons with strong brine, let them remain undisturbed for 4 days, then drain and dry well. Sprinkle the inside of each melon liberally with cloves, cinnamon, nutmeg and pepper, and stuff them with well seasoned French beans and horseradish. Replace and tie on the ends, and pack the melons in a large jar, keeping the cut ends uppermost. Boil the vinegar and spices together for 10 minutes, and when cold pour the liquid over the melons. On three consecutive days reboil the vinegar, and pour it boiling over the melons. When cold, cover closely, and store in a cool, dry place.

**Mixed Pickles.**—To each gallon of vinegar allow  $\frac{1}{4}$  lb. of bruised ginger,  $\frac{1}{4}$  lb. of mustard,  $\frac{1}{4}$  lb. of salt, 2 oz. of mustard seed,  $1\frac{1}{2}$  oz. of turmeric, 1 oz. of ground black pepper,  $\frac{1}{4}$  oz. of cayenne, cauliflowers, onions, celery, gherkins, French beans, nasturtiums, capsciums. Have a large jar, with a tight-fitting lid, in which put as much vinegar as required, reserving a little to mix the various powders to a smooth paste. Put into a basin the mustard, turmeric, pepper and cayenne; mix them with vinegar, and stir well until no lumps remain; add all the

## Preserving, Canning, Etc.

### (Pickles and Catsups)

ingredients to the vinegar, and mix well. Keep this liquor in a warm place, and thoroughly stir it every morning for 1 month, with a wooden spoon, when it will be ready for the different vegetables to be added to it. As these come in season, have them gathered on a dry day, and after merely wiping them with a cloth to free them from moisture, put them into the pickle. The cauliflowers must be divided into small bunches. Put all these into the pickle raw, and at the end of the season, when as many of the vegetables as could be procured have been added, store the pickle away in jars, and tie over with bladder. This old-fashioned method of preserving vegetables is largely employed by those who live in the country. The pickle should be kept for at least 3 months in a cool, dry place before being used.

**Mushrooms, Pickled.**—Button mushrooms, 1 qt.; vinegar, 1 qt.; bruised whole ginger, 1 oz.; white peppercorns,  $\frac{1}{2}$  oz.; mace, 3 blades; salt, to taste. Wash, dry and peel the mushrooms, and cut off the tops of the stalks. Place them in a stewpan, sprinkle salt over them, shake them over the fire until the liquor flows, and keep them on the stove, uncovered, until the greater part of the moisture has evaporated. Then add the vinegar, peppercorns, etc., bring to the boil, and simmer gently for 10 minutes. Turn into jars, cover closely, and store in a cool, dry place.

**Onions, Pickled.**—To each quart of vinegar add 2 teaspoonfuls of allspice, 2 teaspoonfuls of whole black pepper. Have the onions gathered when quite dry and ripe, and with the fingers take off the thin outside skin; then with a silver knife (steel should not be used, as it spoils the color of the onions) remove one more skin, when the onions will look quite clear. Have ready some very dry bottles or jars, and as fast as the onions are peeled put them in. Pour over sufficient cold vinegar to cover them, with pepper and allspice in the above proportions, taking care that each jar has its share of the latter ingredients. Tie down with the bladder, and put them in a dry place, and in a fortnight they will be ready for use.

**Piccalilli.**—Cauliflowers, onions, gherkins, French beans, capsicums, spiced vinegar, mustard, turmeric, curry powder. Divide the vegetables into convenient pieces, throw them into boiling brine sufficiently strong to float an egg, and cook for 3 minutes. Drain well, spread them on large dishes, and let them remain in

### (Canning Vegetables)

the sun until perfectly dry. Prepare the vinegar as directed, and add  $\frac{1}{2}$  oz. each of turmeric and curry powder to each quart of vinegar. Also allow to each quart of vinegar 1 oz. of mustard, which must be mixed smoothly with a little cold vinegar, and afterward stirred into the boiling vinegar, but not allowed to boil. Place the prepared vegetables in jars, cover them completely with vinegar, and when quite cold cover closely.

**Tomato Chow Chow.**—Large tomatoes, 6; Spanish onion, 1; green capsicum, 1; brown sugar, 2 tablespoonfuls; salt, 1 tablespoonful; vinegar,  $\frac{1}{2}$  pt. Peel and chop the onion coarsely. Blanch the tomatoes, remove the skins, and slice them finely. Place the onion and tomatoes in a stewjar, add the capsicum, finely chopped, the sugar, salt and vinegar, and cook in a slow oven until the onion is quite tender. When cold turn into small jars or wide-necked bottles, cover closely, and store in a cool, dry place.

**Tomatoes, Pickled.**—Small tomatoes, spiced vinegar, moist sugar. Prepare the vinegar as directed, and to each quart add 1 dessertspoonful of sugar. Pack the tomatoes loosely in a large jar, cover them with boiling vinegar, and put on a close-fitting lid or plate to keep in the steam. Tie down to completely exclude the air. This pickle will only keep for a short time.

**Tomatoes and Onions, Pickled.**—An equal weight of firm tomatoes and medium-sized Spanish onions; vinegar to cover. To each pint of vinegar allow 1 teaspoonful of peppercorns,  $\frac{1}{2}$  teaspoonful of allspice and  $\frac{1}{2}$  teaspoonful of salt. Peel the onions, place them, with the tomatoes, compactly in a stewpan; add the salt, allspice and peppercorns, tied together in muslin; cover with vinegar, and simmer very gently for 5 or 6 hours. Turn into wide-necked bottles or jars; when cold, cover closely, and store in a cool, dry place.

**Walnut Pickle.**—Walnut pickle is made by steeping fresh and ripe walnuts (freed from shells) in strong brine for a week, removing, drying in the air for a day, then packing in jars and covering with boiling pickling vinegar.

### CANNING AND PRESERVING VEGETABLES, HERBS, ETC.

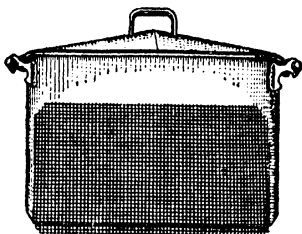
#### Selection and Preparation of Vegetables.

The first step in successful canning is the selection and preparation of the vegetables. Never attempt to can any vegetable that has matured and commenced

## Preserving, Canning, Etc.

### (Canning Vegetables)

to harden, or one that has begun to decay. As a general rule, young vegetables are superior in flavor and texture to the more mature ones. This is especially



Sterilizer, Showing False Bottom

true of string beans, okra, and asparagus. Vegetables are better if gathered in the early morning, while the dew is still on them. If it is impossible to can them immediately, do not allow them to wither, but put them in cold water or in a cold, damp place, and keep them crisp until you are ready for them. Do your canning in a well kept and well dusted room. This will tend to reduce the number of spores floating about, and lessen the chances of inoculation.



Steam Cooker

In the following, directions are given for canning some of the more common vegetables, but the housewife can add to these at will. The principle of sterilization is the same for all meats, fruits and vegetables.

#### Exclusion of the Air.

Even after sterilization is complete the work is not yet done. The spores of bac-

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teria are so light that they float about in the air and settle upon almost everything. The air is alive with them. A bubble of air no larger than a pea may contain hundreds of them. Therefore, it is necessary, after sterilizing a jar of vegetables, to exclude carefully all outside air. If one bacterium or one of its spores should get in and find a resting place, in the course of a few days the contents of the jar would spoil. This is why the exclusion of air is an important factor, not because the air itself does any damage, but because of the ever-present bacteria. All of this may seem new-fashioned and unnecessary to some housekeepers. The writer has often heard it said: "My grandmother never did this, and she was the most successful woman at canning that I ever knew." Possibly so; but it must be remembered that grandmother made her preserves—delicious they were, too—and canned her tomatoes, but did not attempt to keep the most nutritious and most delicately flavored vegetables, such as lima beans, string beans, okra, asparagus, or even corn.

**Containers for Sterilizing.**—A tin clothes boiler, with a false bottom made of wire netting cut to fit it, may be used. The netting is made of medium-sized galvanized wire (No. 16) with  $\frac{1}{2}$ -in. mesh. A false bottom is absolutely necessary, as the jars will break if set flat upon the

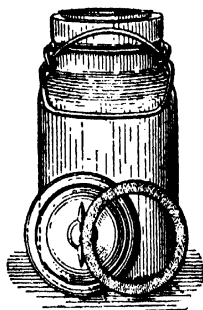


Fig. 1—Spring-top Jar

bottom of the boiler. Narrow strips of wood, straw, or almost anything of this nature, may be used for the purpose, but the wire gauze is clean and convenient. There are several varieties of patent

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### (Canning Vegetables)

steamers or steam cookers in common use. These have either one or two doors, and hold a dozen or more quart jars. They are ideal for canning, but they are some-

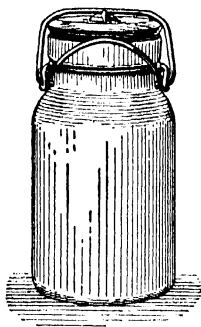


Fig. 2—Position of Spring During Sterilizing

what expensive, and can be easily dispensed with. A common ham boiler or clothes boiler with a tight-fitting cover will answer every purpose.

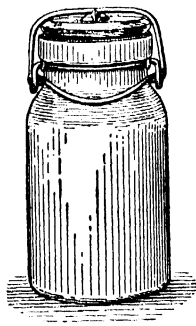


Fig. 3—Position of Spring After Sterilizing

The most satisfactory jar is the one shown in Figs. 1, 2, 3 and 4. This has a rubber ring, and glass top, which is held in place by a simple wire spring. There are several brands of these jars on the market, so no difficulty should be

### (Canning Vegetables)

experienced in obtaining them. Vegetables often spoil after being sterilized because of defective rubbers. It is poor economy to buy cheap rubbers, or to use them a second time. As a general rule, black rubbers are more durable than white ones.

Buy a good grade of jar. The best quality usually retails at from \$1.00 to



Fig. 4—Manner of Testing

\$1.25 a dozen. The initial expense may be, therefore, somewhat high, but with proper care they should last many years. The annual breakage should be less than 3% on the average. In selecting a jar, always give preference to those having wide mouths. In canning whole fruit or vegetables, and in cleaning the jars, the wide mouth will be found to be decidedly preferable.

### Freshness of Flavor and Color.

Vegetables, when canned properly, should retain their attractive color and lose very little of their flavor. It will be found almost impossible to detect any difference either in taste or in appearance between the canned and the fresh article if these directions are carefully followed. The volatile oils which give flavor to most vegetables are not lost during this process of sterilization. Cooking for three short periods in a closed container, at a comparatively low temperature, instead of cooking for one short



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period at a high temperature, or for one long period in an open vessel, makes the vital difference, and insures freshness of flavor and color. After the jars have been sterilized and tested they should be kept in the dark, as the sunlight will soon destroy the color of the vegetable.

#### How to Open a Jar.

Jars of vegetables are sometimes hard to open, unless it is done in just the right way. Run a thin knife blade under the rubber, next to the jar, and press against it firmly. This will usually let in enough air to release the pressure on the top. In case it does not, place the jar in a deep saucepan of cold water, bring to a boil, and keep it boiling for a few minutes. The jar will then open easily.

#### Cautions.

These directions for canning apply only to pint and quart jars. If half-gallon jars are used, always increase the time of boiling, making it an hour and a half instead of one hour. Do not go into canning too deeply at first. Experiment with a few jars in the early part of the season and see if they keep well. It is not a difficult matter to can vegetables properly.

#### Recipes for Canning Vegetables.

**Corn.**—Contrary to general opinion, corn is one of the easiest vegetables to can. The United States Department of Agriculture has shown that the amount of sugar in the sweet varieties diminishes very rapidly after the ear is pulled from the stalk; therefore, in order to retain the original sweetness and flavor it is necessary to can corn very soon after it is pulled, within an hour, if possible. Select the ears with full grains, before they have begun to harden, as this is the period of greatest sugar content. Husk them, and brush the silks off with a stiff brush. Shear off the grains with a sharp knife and pack the jar full; add salt to taste, usually about 1 teaspoonful to 1 qt. is sufficient, and fill up the jar to the top with cold water. Put the rubber ring around the neck of the jar, and place the glass top on loosely. Be careful not to press down the spring at the side of the jar.

Place the false bottom in the boiler, and put in as many jars as the boiler will conveniently hold. Don't try to crowd them in. Leave space between them. Pour in about 3 in. of cold water,

### (Canning Vegetables)

or just enough to form steam and to prevent the boiler from going dry during the boiling. It is not necessary to have the water up to the neck of the jars, as the steam will do the cooking. Put the cover on the boiler, and set it on the stove. Bring the water to a boil and keep it boiling for 1 hour. At the end of that time remove the cover of the boiler and allow the steam to escape. Press down the spring at the side of the jar. This clamps on the top, and will prevent any outside air from entering. The jars can now be removed and cooled, or allowed to stand in the boiler until the next day.

On the second day raise the spring at the side of the jar. This will relieve any pressure from steam that might accumulate inside the jar during the second cooking. Place the jars again in the boiler and boil for 1 hour. Clamp on the top, as on the preceding day, and allow them to cool. Repeat this operation on the third day. In removing the jars from the boiler be careful not to expose them to a draft of cold air while they are hot, as a sudden change in temperature is likely to crack them. After the sterilization is complete the jars may be set aside for a day or two and then tested. This is done by releasing the spring at the side and picking up the jar by the top. If there has been the least bit of decomposition, or if sterilization has not been complete, the top will come off. This is because the pressure on the top has been relieved by the gas formed by the bacteria. In this case it is always best to empty out the corn and fill up the jar with a fresh supply. If canning fruits, or some expensive vegetable, however, examine the contents of the jar, and if the decomposition has not gone far enough to injure the flavor, place it once more in the boiler and sterilize over again. If the top does not come off you may be sure that the vegetable is keeping.

**Beans.**—(See *Lima Beans*; *String Beans*.)

**Beets.**—Although beets will keep in the cellar over winter, it is very desirable to can them while they are young and tender, as the mature beet is apt to be stringy, and lacking in flavor. Wash the young beets, cut off the tops, and put them in boiling water for about an hour and a half, or until they are thoroughly cooked. Take off the skins, cut in thin slices, and pack into the jars. Cover with water, and sterilize in the manner previously described. If a mild pickle is desired, make a mixture of equal parts of water and good vinegar, sweeten to

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taste, and cover the beets with this mixture instead of water.

**Carrots and Parsnips.**—These, if gathered during the early summer, and canned, make most excellent vegetables for the winter. The young plants at that season are not stringy, and have not yet developed the strong taste that is so objectionable to some people. Prepare as you would for the table, and sterilize.

**Cauliflower.**—This vegetable usually keeps very well, but if the supply for the winter should begin to spoil it may be necessary to can it during the summer. Prepare it as you would for the table, pack it into jars, and sterilize.

**Eggplant.**—Pare the eggplant, cut in thin slices, and drop in boiling water for 15 or 20 minutes. Drain off the water and pack the slices in the jar. Cover with water, and sterilize as directed under *Corn*. The slices of eggplant are pliable, and may be taken from the jar without being broken, and either fried in bread crumbs or made into pudding, and baked.

**Herbs for Winter Use, To Dry.**—Gather the herbs on a dry day, just before they begin to flower. Dry them quickly, before or near the fire, then strip the leaves from the stalks, put them in a moderately hot oven, on baking tins, until crisp, then rub them between the palms of the hands until reduced to a powder. Pass through a fine sieve to remove the small stalks, put into hot, perfectly dry bottles, cork tightly, and store for use. Herbs are sometimes dried, and put into paper bags, but this method is not to be recommended, for they not only lose much of their flavor, but they are less easily powdered than when freshly dried.

**Mushroom Powder.**—Large mushrooms,  $\frac{1}{2}$  peck; onions, 2; cloves, 12; pounded mace,  $\frac{1}{4}$  oz.; white pepper, 2 teaspoonfuls. Peel the mushrooms, wipe them perfectly free from grit, remove the black fur, and reject all those that are at all worm-eaten. Put them into a stewpan with the above ingredients, but without water; shake them over a clear fire until all the liquor is dried up, but be careful not to let them burn. Arrange them on tins, dry them in a slow oven, pound them to a fine powder, which put into small, dry bottles, and cork well. Seal the corks and keep it in a dry place. In using this powder, add it to the gravy just before serving, when it will merely require to be boiled up.

**Mushrooms, Preserving.**—To 1 lb. of button mushrooms, carefully wiped and trimmed, add 1 oz. of fine salt, evenly distributed. After a few minutes' stir-

### (Canning Vegetables)

ring, put them in a covered jar and set for  $\frac{1}{2}$  hour in a moderately hot oven. Then pour off the exuded liquor, to it add one-fifth of its measure of B. P. acetic acid, and raise to the boiling point in an enameled saucepan. Finally, pour it back upon the mushrooms, still kept warm, adding  $\frac{1}{2}$  dr. of mace (broken up) and  $1\frac{1}{2}$  dr. of whole black pepper. Set aside for a fortnight.

**Kohlrabi.**—Prepare it as you would turnips, pack in the jar, and sterilize.

**Lima Beans.**—Lima beans lose their flavor very quickly after being shelled; therefore, it is necessary to can them as soon as possible after gathering. Discard all pods that have begun to harden, and proceed as you would with corn.

**Okra or Gumbo.**—This is a vegetable worthy of more extended culture. Although extensively grown in the South, it is comparatively unknown in the North. It is easily kept, and makes a delicious vegetable for the winter. Wash the young and tender pods, cut them in short lengths, pack in the jars, cover with water, and sterilize. Okra is used for soups or stews.

**Parley, To Preserve.**—Use freshly gathered parsley for keeping, wash it perfectly free from grit and dirt, put it into boiling water which has been slightly salted and well skimmed, and then let it boil for 2 or 3 minutes. Take it out, let it drain, and lay it on a sieve in front of the fire, when it should be dried as expeditiously as possible. Store it away in a very dry place, in bottles, and when wanted for use pour over it a little warm water and let it stand for about 5 minutes.

**Peas, English.**—When prepared and canned in the proper way, peas are easily kept, and never lose the delicate flavor that they possess when fresh. Shell the young peas, pack in jars, and sterilize as directed under *Corn*.

**Potatoes, To Preserve.**—For preserving potatoes in store, the floor is sprinkled with fine quicklime; this is covered with a layer 4 or 5 in. thick of potatoes; this by a sprinkling of quicklime again, and so on, using the lime in the proportion of about 1 measure to 40 measures of potatoes. This method checks disease when it is present, and improves the potatoes if they are watery or waxy. Layers of straw and powdered plaster of paris may be substituted for the lime.

**Pumpkin or Winter Squash.**—If provided with a warm, dry cellar, one may keep certain varieties of these vegetables all winter. Some of the best varieties, however, do not keep well, and even the

## Preserving, Canning, Etc.

### (Canning Vegetables)

best keepers, when not properly housed, begin to decay in December or January. It is then necessary to can them in order to save them. If one has a limited number of jars, it is a good plan to fill them all with other vegetables during the summer, and upon the approach of frost to gather the pumpkins and bring them indoors. By the time the pumpkins begin to spoil, enough jars will be emptied to hold them. They can now be steamed and canned in the same way as summer squash. In this way a supply of jars may be made to do double service.

*Soup Herb, Essence of (Kitchener).—*Lemon thyme,  $1\frac{1}{2}$  oz.; winter savory,  $1\frac{1}{2}$  oz.; sweet marjoram and sweet basil, of each,  $1\frac{1}{2}$  oz.; grated lemon peel,  $\frac{3}{4}$  oz.; eschalots,  $\frac{3}{4}$  oz.; bruised celery seed,  $\frac{3}{4}$  oz.; proof spirit,  $1\frac{1}{2}$  pt. Digest from 10 to 14 days. A good flavoring essence for soups, gravies, etc.

*String Beans.*—Select young and tender beans, string them, and break them into short lengths. Pack firmly in the jar, cover with cold water, and add 1 teaspoonful of salt to each quart. Put on the rubber and top, and boil for 1 hour on each of three successive days, as directed under *Corn*. A small pod of red pepper placed in the bottom of the jar will give a delightful flavor to this vegetable.

*Succotash.*—The writer has found that a mixture of corn and lima beans, or succotash, is one of the most difficult things to keep. This furnishes one of the very best mediums for bacterial growth, so extreme care must be taken in the process of canning. It is advisable to gather the corn and beans early in the morning, and prepare and sterilize them in the manner already described. As with summer squash, it is best to boil for  $1\frac{1}{2}$  hours instead of 1 hour.

*Summer Squash.*—Cut the vegetable into small blocks, pack in the jars, and cover with water; add 1 teaspoonful of salt to each quart, and sterilize. It is sometimes preferable with this vegetable, however, to pare off the skin, boil or steam until thoroughly done, mash them, and then pack in the jars, and sterilize. If canned in the latter way, it is advisable to steam them for  $1\frac{1}{2}$  hours instead of 1 hour, on each of three days, as the heat penetrates the jar very slowly. It is absolutely necessary that the interior of the jar should reach the temperature of boiling water. A jar will usually hold about twice as much of the cooked vegetable as it will of the uncooked.

*Tomatoes.*—Every housewife knows

### (Preserving Eggs)

how to can tomatoes. They are very easily kept, even in the common screw-top Mason jar. If one already has on hand a number of jars of this pattern, it is best to use them for preserves or for canning tomatoes, and to purchase the more modern styles for canning other vegetables. In using the Mason jars, be careful to sterilize them first by placing in cold water, bringing to a boil, and boiling for about 10 minutes. The rubber and top should also be immersed in boiling water for the same length of time. Remove them from the boiling water when needed, handling as little as possible. Be careful not to put the fingers on the inside of the top or the inner edge of the rubber. Fill the jar with the cooked tomatoes while steaming hot, put on the rubber, screw on the top firmly, invert it, and let it stand in that position until cool.

*Walnuts, To Preserve.*—To every pint of water allow 1 teaspoonful of salt; walnuts. Place the walnuts in the salt and water for at least 24 hours; then take them out and rub them dry. Old nuts may be freshened in this manner; or walnuts, when first picked, may be put into an earthen pan, with salt sprinkled among them, and with dampened hay placed on the top and then covered down with a lid. The walnuts must be well wiped before they are put on the table.

### PRESERVING EGGS, MEAT, ETC.

#### Coffee.

*Preservation of Roasting Coffee (Liebig's Method).*—After roasting, while still hot, sprinkle over it pulverized sugar, stir it in well, sprinkle on some more, and then put it up for keeping in well closed receptacles. The coffee looks as if coated with varnish, and even if kept for a long time suffers no loss of aroma.

#### Eggs.

*To Tell the Age of.*—This method is based upon the decrease in the density of eggs as they grow old. Dissolve 2 oz. of kitchen salt in 1 pt. of water. When a fresh-laid egg is placed in this solution it will descend to the bottom of the vessel, while one that has been laid on the day previous will not quite reach the bottom. If the egg be 3 days old it will swim in the liquid; and if it is more than 3 days old it will float on the surface, and project above the latter more and more in proportion as it is older.

*To Pack Eggs to Keep for Winter.*—

1.—Dip the eggs into a solution of 2 oz.

## Preserving, Canning, Etc.

### (Preserving Eggs)

of gum arabic in 1 pt. of cold water, let them dry, and pack in powdered, well burned charcoal.

2.—**Packing Liquid.**—Lime, slaked with water, 1 bu.; common salt, 2 or 3 lb.; cream of tartar,  $\frac{1}{2}$  lb.; water, q. s. to form a mixture strong enough to float an egg. Used to preserve eggs, which it is said it will do for 2 years, by simply keeping them in it.

3.—In the common "liming" process, a tight barrel is half filled with cold water into which is stirred slaked lime and salt, in the proportion of about  $\frac{1}{2}$  lb. of each for every pail or bucket of water. Some dealers use no salt, and others add a small quantity of niter— $\frac{1}{4}$  lb. to the half barrel of pickle. Into this the eggs, which must be perfectly fresh and sound, are let down with a dish, when they settle to the bottom, small end down. The eggs displace the liquid, so that when the barrel is full of eggs it is also full of the pickle. Eggs thus pickled, if kept in a cool place, will, ordinarily, keep good for several months. Long storage in this liquid, however, is apt to make the shells brittle, and impart a limy taste to their contents. This may be, in a great measure, avoided by anointing the egg all over with lard before putting in the pickle. Eggs thus prepared are said to keep perfectly for 6 months or more when stored in a cool cellar.

4.—A much better method of storing eggs is the following: Having selected perfectly fresh eggs, put them, a dozen or more at a time, into a small willow basket, and immerse this for 5 seconds in boiling water containing about 5 lb. of common brown sugar per gallon of water. Place the eggs immediately after on trays to dry. The scalding water causes the formation of a thin skin of hard albumen next the inner surface of the shell, the sugar effectually closing all the pores of the latter. The cool eggs are then packed, small end down, in an intimate mixture of 1 measure of good charcoal, finely powdered, and 2 measures of dry bran. Eggs thus stored have been found perfectly fresh and unaltered after 6 months.

5.—A French authority gives the following: Melt 4 oz. of clear beeswax in a porcelain dish over a gentle fire, and stir in 8 oz. of olive oil. Let the resulting solution of wax in oil cool somewhat, then dip the fresh eggs, one by one, into it, so as to coat every part of the shell. A momentary dip is sufficient, all excess of the mixture being wiped off with a cotton cloth. The oil is absorbed in the shell, the wax hermetically closing all the

### (Preserving Eggs)

pores. It is claimed that eggs thus treated and packed away in powdered charcoal, in a cool place, have been found after 2 years as fresh and palatable as when newly laid.

6.—Paraffine, which melts to a thin liquid at a temperature below the boiling of water, and has the advantage of being odorless, tasteless, harmless and cheap, can be advantageously substituted for the wax and oil, and used in a similar manner. Thus coated, and put into the lime pickle, the eggs may be safely stored away for many months; in charcoal, under favorable circumstances, for a year or more.

7.—Dry salt is frequently recommended as a good preservative packing for stored eggs, but practical experience has shown that salt alone is but little better than dry bran, especially if stored in a damp place, or exposed to humid air.

8.—A mixture of 8 measures of bran with 1 measure of powdered quicklime makes an excellent packing for eggs in transportation.

9.—Water glass—silicate of soda—has recently been used in Germany for rendering the shells of eggs non-porous. A small quantity of the clear syrupy solution is smeared over the entire surface of the shell. On drying, a thin, hard, glassy film remains, which serves as an admirable protection, and substitute for wax, oil, gums, etc. Eggs thus coated, and stored in charcoal powder, or a mixture of charcoal and bran, would keep a very long time.

10.—In storing eggs in charcoal, the latter should be fresh, and perfectly dry. If the eggs are not stored when perfectly fresh, they will not keep under any circumstances. A broken egg, stored with sound ones, will sometimes endanger the whole lot. In packing, the small end of the egg should be placed downward; if in charcoal or other powder, they must be packed so that the shell of one egg does not touch that of another, the interstices being filled with the powder. Under all circumstances, stored eggs should be kept in as cool a place as possible. Frequent change of temperature must also be avoided.

11.—Experiments have been made by Director Strauch, of the Agricultural School, in Neisse (Germany), with various methods for keeping eggs fresh. At the beginning of July, 20 fresh eggs were treated by the same method, and examined at the end of February. The results are given below: Kept in brine, all unfit for use; not decayed, but unpalatable from being saturated with salt. Wrapped

## Preserving, Canning, Etc.

### (Preserving Meat)

in paper, per cent. spoiled, 80; kept in a solution of salicylic acid and glycerine, 80%; rubbed with salt, 70%; packed in bran, 70%; coated with paraffine, 70%; painted with a solution of salicylic acid and glycerine, 70%; immersed in boiling water 12 to 15 seconds, 50%; treated with a solution of alum, 50%; kept in a solution of salicylic acid, 50%; coated with soluble glass, 40%; coated with collodion, 40%; coated with varnish, 40%; rubbed with bacon, 30%; packed in wood ashes, 20%; treated with boric acid and soluble glass, 20%; treated with potassium permanganate, 20%; coated with vaseline and kept in lime water, all good; kept in soluble glass, all very good.

#### Meat, To Preserve.

Meat preservatives are now forbidden by law, so none are given.

Dr. Richardson says that putrefactive changes in meat are due to the decomposition of the water contained in the tissues. The means which have been found to arrest this decomposition are, first, a low temperature; second, a high state of desiccation; third, the application of antiseptics; fourth, the exclusion of air.

**Refrigeration.**—Subjecting to a low temperature is a thoroughly effective way of preserving meat, but it can be considered only as temporary, decomposition ensuing when the cold state is abandoned. Nevertheless, its effects are sufficiently lasting to serve practical ends, and the process seems most likely to solve the problem of conveying large quantities of fresh meat to foreign countries. Numerous plans have been devised, all aiming at the production of a sufficiently low temperature at a remunerative cost.

**Beef, Pickle for.**—Pickle to keep beef tongues and pork. To each gallon of water add  $1\frac{1}{2}$  lb. of salt,  $\frac{1}{2}$  lb. of sugar,  $\frac{1}{2}$  oz. of saltpeter, and  $\frac{1}{2}$  oz. of potash. Let these be boiled together until all the dirt from the sugar rises to the top and is skimmed off. Then throw it into a tub to cool, and when cold pour it over the beef or meat, to remain the usual time, say 4 or 5 weeks. The meat must be well covered with pickle, and should not be put down for at least 2 days after killing, during which time it should be slightly sprinkled with saltpeter, which removes all the surface blood, etc., leaving the meat fresh and clean. Some omit boiling the pickle, and find it to answer well, though the operation of boiling purifies the pickle by throwing off the dirt always found in salt and sugar.

**Beef, etc., To Preserve in Hot Weather.**

### (Preserving Meat)

—Put the meat into a hot oven, and let it remain until the surface is browned all over, thus coagulating the albumen of the surface and inclosing the body of the meat in an impermeable envelope of cooked flesh. Pour some melted lard or suet into a jar of sufficient size, and roll the latter around until the sides are evenly coated to the depth of half an inch with the material. Now put in your meat, taking care that it does not touch the sides of the jar (thus scraping away the envelope of grease), and fill up with more suet or lard, being careful to completely cover and envelop the meat. Thus prepared, the meat will remain absolutely fresh for a long time, even in the hottest weather. When required for use the outer portion may be left on, or may be removed, as the occasion may be. The same fat may be used over and over again by melting, and retaining in the melted state a few moments each time, by which means not only all solid portions of the meat which have been retained fall to the bottom, but all septic microbes are destroyed.

**Hams, Curing.**—Few persons understand the proper ingredients and exact proportions to make a suitable pickle for curing hams. This information will doubtless prove of value. The desideratum is to cure the meat so that it will keep in hot weather, with the use of as little salt as possible. Pickle made in the following manner, it is believed, will accomplish this: Salt (coarse or alum salt is best),  $1\frac{1}{2}$  lb.; saltpeter,  $\frac{1}{2}$  oz.; molasses, 1 pt., or brown sugar, 1 lb.; saleratus, 1 teaspoonful. Let these be added to 1 gal. of water, and the amount increased in the same proportions to make the quantity required. Bring the liquor to a boil, taking care to skim just before it begins to boil. Let the pickle cool, and pour it over the meat until entirely covered. The meat should be packed in clean, tight casks, and should remain in the pickle 6 or 7 weeks, when it will be fit to smoke. Green hickory wood is the best article for this purpose. Shoulders prepared in the same way are nearly as good as hams. This pickle is just the thing to make nice corned beef, or corned beef tongues, or any lean meat for drying.

**Smoking Meat.**—1.—**Pyroligneous Acid.**—Take the meat out of the pickle, and dry; with a sponge or brush wash all over; with crude pyroligneous acid; hang up in a cool place, and repeat the application at intervals of a few days, until three coats have been applied.

## Preserving, Canning, Etc.

### (Mustard)

2.—**Liquid Smoke.**—Rectified spirits of tar, 2 oz.; alcohol, 4 oz.; mix, and add crude pyroligneous acid, 20 oz. Shake well, and filter through a filter wetted with the acid. Let the meat dry well after salting, then apply the liquid smoke with a brush to one side of the meat; let it dry a few hours, and then apply to other side; after drying for a few hours, hang up for several days. Then repeat the process, and in another week the meat is ready to be eaten. One quart of liquid smoke is enough for 250 to 300 lb. of meat. See U. S. D., 17th ed., page 21, for uses of crude pyroligneous acid.

### Smoking Eels or Salmon.

To smoke eels or salmon, salt them with ordinary salt and a little niter, and keep them for 4 days in the brine. Then take a large cask, as high as possible, remove the bottom, bore a number of holes at the top and through the staves, and rest it upon stones rather more than a foot high, so that there is an empty space beneath. Now suspend the eels or salmon, previously fastened to thin sticks, in the cask, and light under them a choked fire of birch or oak leaves, juniper twigs and juniper berries, and allow them to remain therein for 3 days. It is important that the fire should not be allowed to burst into flame, and that an abundant quantity of smoke should be produced. To be considered good, smoked eels and salmon should have a nice golden yellow color on the outside and a fresh red color like raw ham on the inside. They should also have a pleasant smell.

### MUSTARD

**Prepared Table Mustard.**—1.—Ordinary Mustard.—Stir gradually 1 pt. of good white wine into 8 oz. of ground mustard seed and a pinch of pulverized cloves, and let the whole boil over a moderate coal fire. Then add a small lump of white sugar, and let the mixture boil up once more.

2.—Pour  $\frac{1}{2}$  pt. of boiling white vinegar over 8 oz. of ground mustard seed, in an earthen pot, stir the mixture thoroughly, then add some cold vinegar, and let the pot stand overnight in a warm place. The next morning add  $\frac{1}{2}$  lb. of sugar,  $\frac{3}{4}$  dr. of pulverized cinnamon,  $\frac{1}{2}$  dr. of pulverized cloves,  $\frac{1}{4}$  dr. of Jamaica pepper, some cardamom, nutmeg, half the rind of a lemon, and the necessary quantity of vinegar. The mustard is now ready, and is kept in pots tied up with bladder.

3.—Mix 8 lb. of ground mustard seed

### (Mustard)

with  $1\frac{1}{2}$  pt. of good cold vinegar, heat the mixture over a moderate fire for 1 hour, add 1 dr. of ground Jamaica pepper, and when cold keep it in well closed jars.

4.—**Very Fine Table Mustard.**—Digest  $1\frac{3}{4}$  oz. of fresh tarragon leaves, 2 bay leaves, 1 lemon (juice and rind),  $\frac{1}{4}$  dr. each of cloves and cinnamon,  $\frac{3}{4}$  dr. of black pepper,  $\frac{3}{4}$  oz. of dill, and 1 onion in  $\frac{1}{2}$  gal. of good vinegar. It is best to use a steam apparatus for the purpose. Then strain the fluid into a porcelain vessel, and while it is yet warm, mix with it 1 lb. of ground black mustard seed, a like quantity of white mustard, 1 lb. of sugar, and  $3\frac{1}{2}$  oz. of common salt. Let the whole digest, stirring frequently, until the mustard has lost some of its sharpness by the evaporation of the ethereal oil, and then dilute, according to taste, with more or less vinegar.

**Ducesseldorff Mustard.**—Brown mustard cake, 10 oz.; yellow mustard cake, 48 oz.; boiling water, 96 oz.; wine vinegar, 64 oz.; cinnamon, 5 dr.; cloves, 15 dr.; sugar, 64 oz.; good white wine, 64 oz. Mix, after the general directions given above.

**Frankfort Mustard.**—Mix 1 lb. of white mustard seed, ground, a like quantity of brown mustard seed, 8 oz. of pulverized loaf sugar, 1 oz. of pulverized cloves, 2 oz. of allspice, and compound the mixture with white wine or wine vinegar.

**French Mustard.**—Take salt,  $1\frac{1}{4}$  lb.; scraped horse radish, 1 lb.; garlic, 2 cloves; boiling vinegar, 2 gal. Macerate in a covered vessel for 24 hours, strain, and add sufficient flour of mustard.

**German Table Mustard.**—Laurel leaves, 8 oz.; cinnamon, 5 dr.; cardamom seed, 2 dr.; sugar, 64 oz.; wine vinegar, 96 oz.; brown cake, 10 oz.; yellow cake, 48 oz. Mix after general directions as given above.

**Kirschner Wine Mustard.**—Reduce 30 qt. of freshly expressed grape juice to half that quantity by boiling over a moderate fire, in a water bath. Dissolve in the boiling liquid 5 lb. of sugar, and pour the syrup through a colander containing 2 or 3 large horseradishes cut into very thin slices and laid on a coarse towel spread over the bottom and sides of the colander. To the colate add the following, all in a state of fine powder: Cardamom seeds,  $2\frac{1}{2}$  dr.; nutmeg,  $2\frac{1}{2}$  dr.; cloves,  $4\frac{1}{2}$  dr.; cinnamon, 1 oz.; ginger, 1 oz.; brown mustard cake, 6 lb.; yellow mustard cake, 9 lb. Grind all together to a perfectly smooth paste, and strain several times through muslin.

## Preserving, Canning, Etc.

### (Mustard)

**Lenormand's Mustard.**—Mix with 2 lb. of ground mustard seed,  $\frac{1}{2}$  oz. each of fresh parsley and tarragon, both cut up fine, 1 clove of garlic, also cut up very fine, and 12 salted anchovies; grind the mixture very fine, add the required mustard and 1 oz. of pulverized salt, and for further grinding dilute with water. To evaporate the water, after grinding the mustard, heat an iron rod red hot and cool it off in the mixture, and then add wine vinegar of the best quality.

**Ravigotte Mustard.**—Parsley, 2 parts; chervil, 2 parts; chives, 2 parts; cloves, 1 part; garlic, 1 part; thyme, 1 part; tarragon, 1 part; salt, 8 parts; olive oil, 4 parts; white wine vinegar, 128 parts; mustard flour, sufficient. Cut or bruise the plants and spices, and macerate them in the vinegar for 15 or 20 days. Strain the liquid through a cloth, and add the salt. Rub up mustard with the olive oil in a vessel set in ice, adding a little of the spiced vinegar from time to time until the whole is incorporated, and the complete mixture makes 384 parts.

**Soyer's.**—Steep mustard seed in twice its bulk of distilled vinegar for 8 days, grind to a paste, and put it into pots, thrusting a red-hot poker into each. Moutarde a l'Estragon: Gently dry 1 lb. of black mustard seed, then powder it fine, and mix it with 2 oz. of salt and sufficient tarragon vinegar to make a paste. In a similar way are prepared several other mustards, by employing vinegars flavored with the respective substances, or walnut or mushroom catsup, or the liquor of the richer pickles, in proportions to suit. Suitable mortars or grinding apparatus can be procured through any jobber in hardware utensils or druggists' sundries, provided only the smallest articles are desired; otherwise, they will have to be made specially.

**Spiced Mustard.**—1.—Yellow mustard flour, 10 lb.; brown mustard flour, 40 lb.; tarragon, 1 lb.; basil, herb, 5 oz.; laurel leaves, 12 dr.; white pepper, 3 oz.; cloves, 12 dr.; mace, 2 dr.; vinegar, 1 gal. Mix the herbs, and macerate them in the vinegar to exhaustion; then add to the mustards, and grind together. Set aside for a week or 10 days, then strain through muslin.

2.—French Mustard.—The following mixture is to be mixed with good wine vinegar, or, better yet, a vinegar in which has been macerated some celery root, garlic, onion and chives: Colman's mustard, 900 parts; sugar, 100 parts; salt, 100 parts; pepper, 50 parts; cinnamon,

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25 parts; cardamom, 10 parts; and ginger, 15 parts.

**Tarragon Mustard.**—Brown mustard flour, 40 parts; yellow mustard flour, 20 parts; vinegar, 6 parts; tarragon vinegar, 6 parts. Boil the mustard in the vinegar, and add the tarragon vinegar.

### SPICES AND VEGETABLE FLAVORINGS

**Caramel, Preparation of.**—Dissolve 7 lb. of crushed sugar in 1 pt. of water; boil it in a 5-gal. copper kettle, stirring occasionally until it gets brown; then reduce the fire and let the sugar burn "until the smoke makes the eyes water." When a few drops, let fall into a tumbler of cold water, sink to the bottom and harden sufficiently to crack, it is done. Then pour on it, by degrees, about 2 qt. of warm water, stirring all the time. When well mixed, filter it, hot, through a coarse flannel filter. Some use lime water to dissolve the burnt sugar. Care must be taken not to overburn it, as a greater quantity is thereby rendered insoluble. The heat should not exceed 221° C., nor be under 204° C.

**Cayenne, Soluble.**—A strong tincture is made by percolating 1 lb. of pods with rectified spirit until  $2\frac{1}{2}$  pt. of tincture are obtained; half the spirit is distilled off (and used for the next percolation) and the residue mixed with 5 lb. of fine dry salt, dried very gently, passed through a sieve, and stored in dry bottles. Sometimes a little sanders or Brazil wood is added to the capsicum.

**Celery Compound.**—1.—Ground celery seed, 25 parts; ground cocoa leaves, 25 parts; ground black haw, 25 parts; ground hyoscyamus leaves, 12.5 parts; powdered podophyllum, 10 parts; ground orange peel, 6 parts; granulated sugar, 100 parts; alcohol, 150 parts; water, q. s. add 400 parts. Mix the alcohol with 150 parts of water, and macerate drugs for 24 hours; pack in percolator, and pour on menstruum till 340 parts is obtained; dissolve sugar in it, and strain.

2.—Celery seed, fresh powder, 3 av. oz.; mace, fresh powder,  $\frac{1}{2}$  av. oz.; pimento, fresh powder,  $\frac{1}{2}$  av. oz.; fine table salt, 12 av. oz. Mix.

3.—Celery seed, fresh powder, 2 av. oz.; fine table salt, 14 av. oz. Mix.

**Curry Powder.**—1.—The formula for Dr. Kitchener's celebrated curry is said to be: Coriander seed, 3 oz.; turmeric, 3 oz.; black pepper, 1 oz.; mustard, 1 oz.; ginger, 1 oz.; allspice,  $\frac{1}{2}$  oz.; cardamom,  $\frac{1}{2}$  oz.; cumin seed,  $\frac{1}{4}$  oz. Reduce to c

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fine powder, mix thoroughly, and preserve in well stoppered bottles.

2.—For those who prefer a hot curry, a formula likely to give satisfaction is Coriander seed,  $1\frac{1}{2}$  lb.; cumin seed,  $\frac{1}{2}$  lb.; turmeric, 1 lb.; ginger, 2 oz.; mustard, 1 oz.; fenugreek, 1 oz.; cayenne,  $1\frac{1}{2}$  oz. Prepare as above. Great care should be exercised in selecting the materials, in order to obtain satisfactory results. It is said that in India some of the ingredients are mixed together while fresh, thoroughly bruised, dried, and then made into a powder with the other substances.

3.—The following is said to be true Indian curry: Coriander seed, 360 gr.; turmeric, 100 gr.; fresh ginger, 260 gr.; cumin seed, 18 gr.; black pepper, 54 gr.; poppy seed, 94 gr.; cinnamon, 20 gr.; cardamom, 40 gr.; cloves, 20 gr.; half a coconut, grated. All but the coconut to be ground together. In order to obtain good results the materials should be selected with great care.

*Imperial Spices.*—Lemon peel (the thin outer part only), 180 parts; common salt, 80 parts; mustard seed, 40 parts; black pepper, 40 parts; cloves, 20 parts; ginger, 20 parts; cayenne pepper, 20 parts; powder, and mix well together. Lemon peel of the character mentioned can be obtained in the German market, and possibly here. If not, it may be prepared by peeling fresh lemons in the manner indicated. This, of course, adds to the cost of the product, but at the same time improves its flavor.

*Mixed Spices.*—1.—Powdered allspice,  $\frac{1}{2}$  oz.; powdered nutmeg, 1 oz.; powdered cloves, 1 oz.; powdered cinnamon, 1 oz.

2.—Allspice, 140 parts; cloves, 140 parts; ginger, 115 parts; long pepper, 100 parts; black pepper, 75 parts; coriander seed, 75 parts; white pepper, 60 parts; cassia bark, 55 parts; nutmeg, 55 parts; capsicum, 45 parts; white mustard seed, 45 parts; cassia buds, 35 parts; mace, 25 parts; caraway seed, 10 parts; anise seed, 3 parts; cardamom seed, 2 parts.

3.—Powdered turmeric, 1 oz.; powdered licorice, 1 oz.; powdered coriander,  $\frac{1}{2}$  oz.; powdered caraway, 4 dr.; powdered fenugreek, 1 dr.; powdered anise, 1 dr. Mix.

4.—Powdered ginger, 1 oz.; powdered nutmegs,  $\frac{1}{4}$  oz.; powdered cloves,  $\frac{1}{2}$  oz.; powdered mace,  $\frac{1}{4}$  oz.; powdered cinnamon, 1 oz.; powdered allspice, 1 oz. Mix.

*Salt To Prevent the Caking of.*—It is claimed that by adding to salt, glycerine, or a mixture of glycerine and cotton-seed oil, in the proportion of 10 oz. of glyc-

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erine to 125 lb. of salt, or 2 to 3 oz. of glycerine and 2 to 3 oz. of cotton-seed oil, the caking of table salt is entirely prevented.

*Sausage Seasoning.*—1.—Cayenne pepper, 1 oz.; cumin, 1 oz.; cassia, 1 oz.; nutmeg, 2 oz.; pimento, 6 oz.; black pepper, 8 oz.; salt, 8 oz. Mix.

2.—It will be noticed that this formula, from a British source, omits that old American standby, sage: Capsicum, 1 part; cumin, 1 part; cassia, 1 part; nutmeg, 2 parts; pimento, 6 parts; black pepper, 8 parts; salt, 8 parts.

3.—Flavor for Gallic Sausage.—Black pepper, 1 lb.; clove, 5 oz.; nutmeg,  $4\frac{1}{2}$  oz.; ginger, 9 oz.; anise,  $2\frac{1}{2}$  oz.; coriander,  $2\frac{1}{2}$  oz. Grind all together.

*Vegetables, Herbs, Spices, etc., Flavoring.*—Many flavorings are used in meat dishes, some of which are familiar to all cooks—onions, carrots, turnips and garlic being perhaps the most widely known. Butter, too, may be regarded as one of the most common seasonings, and, of course, makes the dish richer. Meat extract is also used for flavoring many meat dishes and other foods, as are also, though less commonly, similar extracts made from clams or other "sea food." The following list includes these with various others, a number of which it is convenient to keep always on hand: Onions, carrots, green peppers, parsnips, turnips, tomatoes, fresh, canned or dried; celery tops and parsley, either fresh or dried; sage, savory, thyme, sweet marjoram, bay leaf, garlic, lemon rind, vinegar, capers, pickles, olives, currant jelly, curry powder, cloves, peppercorns, celery seed, meat extract, chili sauce, pepper sauce, or some similar hot or sharp sauce, and some kind of good commercial meat sauce. Some hints regarding the use of such flavorings follow:

1.—Flavor of Fried Vegetables.—Most of the stews, soups, braised meats and pot roasts are very much improved if the flavoring vegetables which they contain, such as carrots, turnips, onions, celery, or green peppers, are fried in a little fat before being cooked with the meat. This need not complicate the preparation of the meat or increase the number of utensils used, for the meat itself is usually seared over in fat, and the vegetables can be cooked in the same fat before the browning of the meat.

2.—Onion Juice.—Cook books usually say that onion juice should be extracted by cutting an onion in two and rubbing the cut surface against a grater. Considering how hard it is to wash a grater,



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this method has its drawbacks. Small amounts of juice may be obtained in the following simpler way: Peel the onion, and extract a few drops of juice by pressing one side with the dull edge of a knife.

3.—**Green Peppers.**—The flavor of green peppers gives an acceptable variety. The seed should always be removed. The peppers should be chopped and added to chopped meat or other meat dishes. Meat mixed with bread crumbs may be baked in the pepper shells and the stuffed peppers served as a separate dish.

4.—**Parsley.**—It is easy to raise parsley by growing it in a pot in the kitchen window, and thus to have it always on hand fresh, or the leaves may be kept for a long time if sealed up in a fruit jar and stored in a cool place. Parsley, mint, and celery tops may all be dried, rubbed into fine bits, and kept in airtight jars. Recipes usually say to chop fresh parsley with a knife on a board. But a board is a hard thing to wash, and a plate serves the purpose quite as well.

5.—**Bay Leaf.**—Bay leaf is one of the best, and at the same time one of the most abused flavors. In small quantities, it gives a very pleasant flavor to soups and gravies, but in large quantities it gives a rank rosinlike taste. Remember that half a bay leaf is the allowance for 3 qt. of soup stock. This will indicate how small a quantity should be used for the portion of gravy usually served at a meal. With this precaution in mind, bay leaf may be recommended as a flavoring for many sauces, particularly tomato sauce.

6.—**A Kitchen Bouquet.**—A "bouquet," such as is often referred to in recipes, may be made as follows: A sprig each of parsley, savory and thyme, one small leaf of sage, and a bay leaf. This will flavor 1 gal. of soup when cooked in it for an hour, and should not remain in it longer.

7.—**Horseradish.**—Horseradish, like mustard, is more often served with meat than used to flavor it during cooking. A very palatable sauce, especially good with boiled beef, is made by adding grated horseradish and a little vinegar to a little whipped cream, or as follows: Thicken milk with cracker crumbs by heating them together in a double boiler, using 3 tablespoonfuls of cracker crumbs to 1½ cupfuls of milk. Add one-third cupful of grated horseradish, 3 tablespoonfuls of butter and ½ teaspoonful of salt, or thicken with butter and flour some of the water in which the meat was boiled; add a generous quantity (1 or 2 tablespoon-

### (Spices, Etc.)

fuls) of grated horseradish, boil a short time, and serve. This recipe is the most usual in German homes where the sauce is a favorite.

8.—**Acid Flavoring.**—Vinegar, lemon juice and sour jelly, like currant, are often used to flavor the thick gravies which are a part of meat stew or which are served with it. Vinegar is an old-fashioned relish, which was often added to bacon or salt pork and greens, pork and beans, corned beef and cabbage, and similar dishes. These flavors combine well with that of brown flour, but not with onions or other vegetables of strong flavor. The idea that vinegar, used in small quantities, is unwholesome, seems to be without foundation.

9.—**Pickles.**—Chopped pickles are sometimes added to the gravy served with boiled mutton. They are cheaper than capers, and serve somewhat the same purpose. Chopped pickles are also very commonly used in sauces for fish, and in many others, to give a distinctive flavor.

10.—**Olives.**—Chopped olives also make a welcome variety in meat sauce, and are not expensive if they are bought in bulk. They will not spoil if a little olive oil is poured on the top of the liquor in which they are kept. This liquor should always completely cover them.

11.—**Chili Sauce, Commercial Meat Sauces, etc.**—Recipes often may be varied by the addition of a little chili sauce, tomato catsup, or a commercial meat sauce. These may be called emergency flavors, and used when it is not convenient to prepare other kinds of gravies.

12.—**Sausage.**—A little sausage or chopped ham may be used in chopped beef.

13.—**Curry Powder.**—This mixture of spices, apparently originating in India, but which is now a common commercial product everywhere, is a favorite flavoring for veal, lamb or poultry. The precaution mentioned in connection with bay leaves, however, should be observed. A small amount gives a good flavor. It is usually used to season the thick sauces with which meats are served, or in which they are allowed to simmer. While the term "curry" is usually employed to describe a particular mixture of spices made up for the trade, it has another meaning. The words "curry" or "curried" are sometimes used to describe highly seasoned dishes of meat, eggs or vegetables prepared by methods that have come from India or other parts of the East.

## Preserving, Canning, Etc.

### (Pudding Preparations)

#### PUDDING PREPARATIONS

**Custard Powder.**—1.—Arrowroot, 8 oz.; best corn flour, 7 oz.; powdered saffron, 10 gr.; oil of bitter almonds, 24 drops; oil of nutmeg, 12 drops. Mix the powders in a mortar, gradually add the oils, and pass through a fine sieve.

2.—Arrowroot, 8 oz.; rice flour, 8 oz.; gum tragacanth,  $1\frac{1}{4}$  oz.; powdered turmeric,  $2\frac{1}{2}$  dr.; oil of bitter almonds, 20 minims; oil of lemon, 20 minims; oil of nutmeg, 10 minims.

3.—Corn flour, 7 lb.; arrowroot, 8 lb.; oil of almonds, 20 drops; oil of nutmegs, 10 drops; tincture of saffron to color. Mix the tincture with a little of the mixed flours; then add the essential oils, and make into a paste; dry this until it can be reduced to a powder, and then mix all the ingredients by sifting several times through a fine hair sieve.

**Egg Powder.**—The following formulas are said to be employed by manufacturing bakers:

1.—Sodium bicarbonate, 8 oz.; tartaric acid, 3 oz.; cream of tartar, 5 oz.; powdered turmeric, 3 dr.; ground rice, 16 oz. Mix, and pass through a fine sieve. One teaspoonful to a dessertspoonful (according to the article to be made) to be mixed with each  $\frac{1}{2}$  lb. of flour. Two teaspoonfuls equal one medium-sized egg.

2.—Baking powder, 1 part; rice flour, 2 parts. Previous to mixing, color the rice flour with a solution of aniline orange to a dark egg-yolk tint; dry, then mix with the baking powder.

**Rennet, Liquid.**—1.—Rennet, the substance which produces coagulation in milk, is secreted not only in the stomachs of milk-consuming animals, but has been obtained from the digestive organs of fowls and fish also. What end it serves in the latter instances has not been ascertained. To make this ferment available for the rapid coagulation of milk apart from the natural digestive process, it can be easily separated by solution. The mucous membrane of the stomach of a calf from 5 to 10 days old is usually, if not always, employed as its source.

2.—To prepare essence of rennet on a large scale, Hager directs that 1.5 kgm. of glycerine be placed in a 10-l. bottle, together with the insides of 20 fresh calves' stomachs, scraped out with a dull knife; 800 grams of common salt, and enough water to fill the bottle, to be added. This should be macerated for 6 days, with occasional agitation, strained through cheese cloth, with pressure, mixed

### (Sauces)

with from 150 to 200 grams of kaolin, and filtered.

3.—Fresh rennets, 3; chloride of sodium, 12 av.oz.; glycerine, 8 fl.oz.; alcohol, 8 fl.oz.; sour milk, 16 fl.oz.; water, sufficient to make 1 gal. Chop the rennets small, dissolve the salt in  $\frac{1}{2}$  gal. of water, add the glycerine, alcohol and sour milk; mix, and macerate the rennets in the mixture during 4 or 5 days, with frequent agitation; add some precipitated phosphate of lime, and filter through paper, adding sufficient water through the filter to make the product measure 1 gal.

4.—Junket Tablets.—Rennin, 1 gr.; sodium chloride, 5 gr.; sugar, 5 gr. For one tablet. Rennin tablets may also now be purchased.

5.—From Pepsin.—Pepsin, in scales, 1 dr.; wine, 1 fl.oz.; glycerine,  $\frac{1}{2}$  fl.oz.; water, to make 4 fl.oz.; hydrochloric acid, 15 drops. Mix.

#### SAUCES AND SALAD DRESSINGS

##### Sauces.

**Anchovy Butter.**—Take 1 part of anchovies which have been beaten to a paste, and pass through a sieve; add 2 parts of butter, and spice to suit. Cayenne pepper or paprika may be used to advantage.

**Anchovy Essence.**—Anchovy essence can be made with either canned or bottled anchovies. Take the fish, and rub to a pulp in a mortar, and then pass through a fine sieve. To  $\frac{1}{4}$  lb. of anchovies add  $\frac{1}{4}$  lb. of water; boil for 15 minutes, and strain; then add  $\frac{1}{2}$  oz. of salt and  $\frac{1}{2}$  oz. of flour, and the pulped anchovies. The mixture is allowed to simmer over the fire for 3 or 4 minutes. After the preparation is cool add 2 oz. of strong vinegar. The product should be bottled in small bottles and tightly corked and covered with bottle wax.

**Anchovy Paste.**—Prepared by taking 1 lb. of anchovies, 1 lb. of water, and  $2\frac{1}{4}$  oz. of salt and  $2\frac{1}{4}$  oz. of flour; add a small quantity of cayenne pepper (say 1-10 oz.), a small quantity of grated lemon peel, and  $\frac{1}{2}$  oz. of mushroom catsup.

**Anchovy Sauce.**—Take 3 or 4 anchovies, and chop them fine; add 3 oz. of butter, 2 oz. of water, 1 oz. of vinegar and 1 oz. of flour. Melt the butter over a water bath, add the water and the vinegar, and lastly the flour and the anchovies; stir until the mixture is thick, then rub through a wire sieve. This preparation should be kept on ice, and will not keep indefinitely.

**Fish.**—1.—Port wine, 1 gal.; mountain, 1 qt.; walnut catsup, 2 qt.; anchovies

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### (Sauces)

and liquor, 2 lb.; lemons, 8; shallots, 30; scraped horseradish,  $1\frac{1}{2}$  lb.; flour of mustard, 8 oz.; mace, 1 oz.; cayenne, q. s.; boil up gently; strain, and bottle.

2.—Anchovies, 24; shallots, 10; scraped horseradish, 3 spoonfuls; mace and cloves, of each  $\frac{1}{4}$  oz.; sliced lemons, 2; anchovy liquor, 8 oz.; water, 1 pt.; hock or Rhenish wine, 1 bottle; walnut catsup,  $\frac{1}{2}$  pt.; boil to  $2\frac{1}{2}$  lb., strain, and bottle.

*Gravies*.—1.—Brown Gravy Salt.—For coloring soups, gravies, etc.: Salt, 8 oz.; white sugar, 4 oz.; red pepper, 4 oz. Mix all together in a mortar; with care transfer to a frying-pan, over a good fire, stirring constantly till brown enough, and rub through a sieve while hot.

2.—Browning for Gravies.—Best white sugar, 8 oz.; butter, 3 oz. Boil together until brown.

*Harvey Sauce*.—Good vinegar, 1 qt.; anchovies, 3; soy, 1 tablespoonful; walnut catsup, 1 tablespoonful; finely chopped shallot, 1; finely chopped clove of garlic, 1; cayenne,  $\frac{1}{4}$  oz.; cochineal, a few drops. Cut each anchovy into 3 or 4 pieces, place them in a wide-necked bottle or unglazed jar, add the shallots, garlic, and the rest of the ingredients, and cover closely. Let the jar stand for 14 days, during which time the contents must be either shaken or stirred at least once a day. At the end of this time strain into small bottles, cork them securely, and store the sauce in a cool, dry place.

*Herb Sauce*.—Horseradish, 1 stick; each of winter savory, basil, marjoram, finely chopped shallots, 2; a few sprigs of thyme, tarragon; cloves, 6; the finely pared rind and juice of 1 lemon; good vinegar, 2 tablespoonfuls; water, 1 pt. Wash and scrape the horseradish, and remove the stalks of the herbs. Put all the ingredients together in a stewpan, simmer gently for 20 minutes, then strain, and when quite cold pour into small bottles; cork securely, and store for use.

*Soy*.—Genuine soy is a species of thick black sauce, imported from China, prepared with white haricots, wheat flour, salt and water; but a spurious kind is made in England, as follows: Seeds of dolichos soja (peas or kidney beans may be used for them), 1 gal.; boil till soft; add bruised wheat, 1 gal.; keep in a warm place 24 hours; then add common salt, 1 gal.; water, 2 gal.; put the whole into a stone jar, bung it up for 2 or 3 months, shaking it very frequently; then press out the liquor; the residuum may be treated afresh with water and salt for soy of an inferior quality.

*Tomato Sauce*.—To each quart of to-

### (Salad Dressings)

mato pulp allow 1 pt. of chilli vinegar,  $\frac{1}{4}$  pt. of soy, 1 tablespoonful of anchovy essence, 2 finely chopped shallots, 1 finely chopped clove of garlic, and salt to taste. Bake the tomatoes in a slow oven until tender, rub them through a fine sieve, and measure the pulp. Put it into a stewpan, add the rest of the ingredients, simmer until the shallots and garlic are quite tender, and pass the whole through a tammy or fine hair sieve. Store in airtight bottles.

*Vegetable Butters*.—1.—Wheat flour, 28 lb.; blanched Brazil nuts, 14 lb.; earthnut oil, 14 lb.; salt,  $3\frac{1}{2}$  lb.; butter coloring. Pound the nuts in a mortar, gradually pouring in the nut oil; then rub up to a jelly with flour and salt, coloring during the rubbing up.

2.—Wheat flour, 14 lb.; banana flour, 14 lb.; blanched peanuts, 15 lb.; vegetable oil,  $1\frac{1}{2}$  gal.; salt,  $3\frac{3}{4}$  lb.; butter coloring. As before.

*Worcestershire Sauce*.—There are many concerns, we believe, who make a sauce which they call Worcestershire. That made in England by Lea & Perrin is considered the best, and many have tried to imitate it, but with indifferent success. Of the many formulas appearing in print, the following will serve as an example: Vinegar, 1 qt.; powdered pimento, 2 dr.; powdered cloves, 1 dr.; powdered black pepper, 1 dr.; powdered mustard, 2 oz.; powdered Jamaica ginger, 1 dr.; common salt, 2 oz.; shallots, 2 oz.; tamarinds, 4 oz.; sherry wine, 1 pt.; curry powder, 1 oz.; capsicum, 1 dr. Mix all together, simmer for 1 hour, and strain. Let the whole stand for a week, strain it, and fill in bottles. Worcestershire sauce is never quite clear; straining to remove the coarser particles is all that is necessary.

### Salad Dressing.

1.—The yolks of 3 hard-boiled eggs; salad oil, 4 tablespoonfuls; Worcestershire sauce, or mushroom catsup, 2 tablespoonfuls; vinegar, 2 tablespoonfuls; made mustard, 1 teaspoonful; salt, 1 teaspoonful; pepper,  $\frac{1}{2}$  teaspoonful. Rub the yolks of eggs through a fine sieve, mix with them the salt, pepper and mustard; stir in the salad oil, add the Worcestershire sauce and vinegar gradually, and when thoroughly incorporated the dressing is ready for use. The whites of the eggs should be utilized for garnishing the salad. The above will be found an excellent dressing for cold meat salads to be served with cold meat.

2.—Salt,  $\frac{1}{2}$  oz.; sugar, 1 oz.; salad oil, 2 oz.; eggs, 2 oz. Emulsify, and add

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### (Salad Dressings)

tincture of capsicum, 20 drops; mustard,  $\frac{1}{2}$  oz.; malt vinegar, 6 oz. Mix.

**Cooked Salad Dressing.**—Eggs, 2; vinegar, 1 gill; milk, 2 gills; oil or butter, 1 tablespoonful; salt, 1 teaspoonful; mustard, 1 teaspoonful; pepper,  $\frac{1}{4}$  teaspoonful. Put the oil and dry ingredients into a bowl, and mix well; add the eggs, and beat for 5 minutes; then add the vinegar, and beat 1 minute; now add the milk, place the bowl in a pan of boiling water, and cook until the sauce thickens like thin cream. It will take about 10 minutes. Stir the sauce constantly while cooking. Cool, and bottle what you do not require for immediate use. This sauce is good for nearly all kinds of cooked vegetables. If butter is substituted for the oil, add it just before taking the sauce from the fire.

**Cream Salad Dressing.**—1.—Salt, 2 dr.; white sugar, 1 oz.; best olive oil, 2 oz.; eggs, 2. Make an emulsion of above and add it to the following ingredients, previously mixed: Tincture of cayenne, 20 drops; mustard, 1 oz.; malt vinegar, 6 oz.

2.—**Sour Cream Dressing.**—Sour cream,  $\frac{1}{2}$  pt.; lemon juice, 2 tablespoonfuls; vinegar, 2 tablespoonfuls; sugar, 1 scant tablespoonful; salt, 1 teaspoonful; pepper,  $\frac{1}{4}$  teaspoonful; mixed mustard, 1 teaspoonful or more. Beat the cream with an eggbeater until smooth, thick and light. Mix the other ingredients together and gradually add to the cream, beating all the while. This dressing may be modified to suit different vegetables. Having beaten sour cream for a foundation, the seasoning may be anything desired, as, for example, the mustard and lemon may be omitted, and the dressing be seasoned highly with any kind of catsup. A sweet cream may be substituted for the sour; it should be quite thick.

**French Dressing.**—Vinegar, 1 tablespoonful; olive oil, 4 tablespoonfuls; salt,  $\frac{1}{4}$  teaspoonful; pepper,  $\frac{1}{8}$  teaspoonful. Put the salt and pepper in the salad bowl, or in a small bowl, if the sauce is to be served separately; add a little oil, and stir well; then gradually add the remainder of the oil, stirring all the while. Last of all, stir in the vinegar, which should be diluted with water if very strong. This sauce may be modified to suit different vegetables. As it is given it is right for lettuce, chicory, cooked asparagus, cauliflower, artichoke, etc. Cream may be substituted for the oil, but the salad is not so rich.

**Mayonnaise Salad Dressing.**—Yolks of 3 hard-boiled eggs; syrup, 1 fl.oz.; cay-

### (Vinegar)

enne pepper, 15 gr.; salt, 180 gr.; mustard, 1 oz.; Nestle's condensed milk, 1 tin; tarragon vinegar, 10 fl.oz.; olive oil, 22 $\frac{1}{2}$  fl.oz. Mix in the order given, adding the two last ingredients alternately, and rubbing well to form a perfect emulsion.

**Olive Oil, Facsimile.**—Corn (maize) oil, 10 gal.; distilled water, 8 gal.; sulphur olive oil, 2 gal.; arachis oil, 2 gal.; concentrated sulphuric acid (common salt as neutralizer), 1 gal.; orange oil, 1 dr. Put olive and arachis oils into a pan holding about 7 gal. Float this in a tub of cold or iced water, and gradually add the sulphuric acid, stirring with a glass rod; also add some water, then leave to rest. Next add a strong solution of salt in water, adding this until the acid is neutralized. Then settle, draw off the clear oil that rises to the top, mix with the distilled water and corn oil, color with the oil of orange, and finally filter through fuller's earth or whiting. This is a cheap and satisfactory oil, also quite pure and edible.

**Olive Oil, Factitious.**—Genuine olive oil, 20 gal.; clear rape oil, 10 gal.; sweet cotton oil, 10 gal. Warm the rape oil and mix the cotton oil, adding them to the olive oil; strain, if necessary. This oil must not be branded as "olive oil."

### VINEGAR AND VINEGARS

Including ordinary vinegar, aromatic, toilet vinegars, etc.

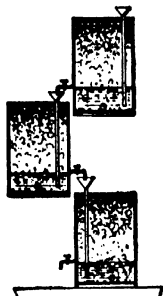
#### Vinegar Making.

The following description is for those who wish to make vinegar on a moderately large scale. For small quantities, the receipts which follow are better adapted. The accompanying illustration shows the arrangements of the Hengstenberg generators. The stock mixture is contained in a reservoir situated above the generators. The generators, of which there may be from 3 to 7, stand vertically, one above the other, as stated. In the morning the upper generator cask is filled with the stock mixture from the reservoir, and as soon as it is filled the faucet near the bottom of the upper cask is opened and the stock mixture allowed to fill the next lowest generator cask. From this the stock mixture is drawn over the next lower cask, and so on to the lowest one, so that every generator cask has been completely filled with the stock mixture for a short time. The faucets have an extra wide bore, so that the flow from one cask into the other takes the least possible time; they remain open after the liquid

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### (Vinegar)

has flowed off, and thus are the means for the admission of air into the casks. The shavings with which the casks are filled are completely and uniformly soaked with the stock mixture, and dry places or nests, which often cause great troubles and irregularities in other systems, are an absolute impossibility with this system. The formation and spreading of



Vinegar Apparatus

diseases, and more especially the propagation of the so-called vinegar flies, is prevented in this system. After the mixture has arrived in the lowest cask, about one-fifth to one-quarter is racked off as ready vinegar, so that if six generators of 150 gal. capacity are worked together daily, from 25 to 30 gal. of ready vinegar are drawn off. The balance of the stock mixture is now brought back to the reservoir, and enough fresh stock mixture is added to fill the same up. It remains there till the next morning, when it is carried through the same circuit in the same manner as above described. It is evident that the labor is very simple; the opening and closing of the faucets may be attended to by an apprentice, and the lifting of the stock mixture to the reservoir may be done by any common and untrained laborer, if, as it naturally would be in larger establishments, a pump is not preferred for this purpose. The building for a vinegar factory worked on this plan does not require any special appointments, and therefore any locality may be utilized, and such buildings having rooms from 8 to 10 ft. high, one above the other, are very well adapted for arrangements on a larger scale. In every story 2 or 3 casks can be placed in such a manner that the lower cask in

### (Vinegar)

the upper story connects with upper casks of the next lower story by means of a piece of rubber hose, which is drawn over the faucet key, and passes through a 2-in. hole in the floor. The reservoir should be in the form of flat tubs (storage casks sawed in two will serve very well), and are placed in the top story, where it is warmest, and where the acidification of the stock mixture remains in constant activity. The Hengstenberg system of generating vinegar, on the whole, offers some advantages, but it would appear to us that these advantages can be fully utilized only by works of comparatively small capacity, and that for yield in quantity and strength it cannot compete with the Schuetzenbach generators, if the same are worked by expert hands and under proper conditions. Nevertheless, the progressive manufacturer will not lose anything by trying a set of small generators of this kind; it may be got up with almost no expense at all, from a few odd barrels and faucets, and as it can be run regardless of interruptions, it may do good service in the production of one or the other fancy brands of vinegar, which to produce it is sometimes very desirable, although it would not be advisable to attempt the same by interrupting the working of a large generator.

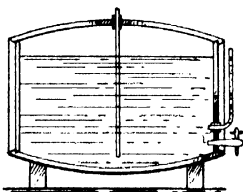
**Home-made Vinegar.**—Take an alcoholic liquid, place on its surface traces even of acetic ferment, leave it exposed to the air in a proper temperature, and the ferments do the rest. This is the old Orleans method, which was discarded by the trade on account of the time it takes (about 2 months) before good vinegar is obtained. For household use, this does not matter, on account of the moderate consumption, and this process is the best for the purpose when employed under the following condition: A cask is chosen in accordance with the quantity consumed. A 10-gal. keg would be large enough for almost any household. If it has iron hoops, they should be painted, as otherwise they would be rapidly destroyed by the vapors of acetic acid. In each head a hole should be bored, say a quarter of the way down from the top chime, and covered with mosquito netting, so as to prevent the entry of any insects. Below the front opening is placed a bent glass tube, tightly fixed in a cork, so as to show the level of the liquid. A wooden tap is inserted below this. It is essential that no metal tap be used, and the wooden tap should turn easily, and the cask should be solidly fixed, so as to prevent any shaking, which would break

## Preserving, Canning, Etc.

### (Vinegar)

the veil formed by the cellules of the ferment, and so destroy them.

For the same reason, it is as well to fit a wide glass tube through the bung-



Vinegar Barrel

hole, reaching nearly to the bottom of the cask, through which the wine to be aceticated can be added without breaking the veil of cellules on the surface of the liquid.

To start the affair working, the operation is very simple. The wine to be aceticated, reduced to 12% proof, together with one-third of its volume of good vinegar, is poured into the cask, so that the level of the liquid comes within  $\frac{1}{2}$  in. of the airholes in each head. Then the vinegar ferment, previously prepared, is carefully placed on the surface of the liquid, and the glass tube is inserted, and secured into the bunghole through a cork bung, and the cask left in a proper temperature. At the end of from 4 to 6 weeks vinegar may be drawn, and every succeeding fortnight, each time replacing the quantity drawn by an equal quantity of wine to be treated.

Such an installation can be fixed in any house—in a kitchen, for instance, provided always the temperature is constant and suitable. To obtain good vinegar, sound, clear wine should be used, and reduced to from 12% to 15% proof spirit. Above that strength acetication is slow and somewhat incomplete.

**Quick Process for Making Vinegar.**—What is known as the German process is the most rapid method of making a good vinegar. In this, dilute alcoholic liquor to which one-thousandth part of honey or extract of malt has been added, is caused to trickle down through a mass of beechwood shavings, previously steeped in vinegar, and contained in a vessel called a vinegar generator (*essigbildler*). It may consist of a large oak hogshead or barrel, furnished with a loose lid or cover, a few inches below which is fitted a perforated shelf having a number

### (Vinegar)

of small holes loosely filled with pack-thread about 6 in. long, knotted at the upper end to prevent their falling through. Several small glass tubes, long enough to project slightly above and below the shelf, are also fitted in perforations in the shelf to serve as air vents. The vessel at the lower part is pierced with 8 or 10 holes, equally distributed around the sides at about 6 in. above the bottom, to admit of the entrance of air. A small siphon tube, the upper curve of which is 1 in. below the airholes, serves to carry off the liquid as fast as it accumulates at the bottom. The alcoholic liquid, at a temperature of 75 to 83° F., is run in on the shelf, and slowly trickles down through the holes by means of the pack-thread, diffuses itself over the shavings, slowly collects at the bottom, and runs off by the siphon exit. The air enters by the lower holes, passes freely through the shavings, and escapes by the glass tubes. The temperature within the apparatus soon rises to about 100° F., and remains stationary at this point, while the action goes on favorably. The liquid generally requires to be passed 3 or 4 times through the cask before its acetication is complete.

### Clarifying Vinegar.

Albumen, 3 lb.; neutral tartrate of potassium, 4-5 oz.; alum,  $\frac{1}{2}$  lb.; ammonium muriate, 7 lb. The powder must not be added direct to the liquid to be cleared, but should first be mixed with soft water. About 20 gr. of this powder are said to be sufficient for clearing 1 gal. of fluid.

### Vinegars.

1.—Put in 20 gal. of rain water  $2\frac{1}{2}$  lb. of acetic acid, 1 gal. of molasses and 1 qt. of yeast. Stir well, and allow to stand from 1 to 3 weeks. If stronger vinegar is desired, add more molasses.

2.—Molasses, 2 qt.; yeast, 1 qt.; soft water, 6 gal. Put in keg, and put wire gauze over bung, and stand in a warm place for 3 weeks.

3.—Acetic acid, 2 lb.; molasses, 2 qt.; water, 20 gal. Shake, and allow to stand 2 or 3 weeks.

4.—Cider, 20 gal.; water, 10 gal.; yeast, 2 gal.

5.—Cheap Vinegar.—Put 2 gal. of molasses and 2 qt. of yeast in  $12\frac{1}{2}$  gal. of warm rain water. Let it ferment. As the vinegar is used, add the above ingredients in the same proportions.

6.—A cheap vinegar consists of 25 gal. of warm rain water with 4 gal. of mo-

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### (Vinegar)

lasses and 1 gal. of yeast. The mixture can be used after it has been allowed to ferment.

**Camp Vinegar.**—1.—Vinegar,  $1\frac{1}{2}$  qt.; walnut catsup,  $1\frac{1}{2}$  pt.; mushroom catsup,  $4\frac{1}{2}$  tablespoonfuls; garlic, 6 heads; cayenne,  $\frac{1}{4}$  oz.; soy, 3 tablespoonfuls; port wine, 3 glassfuls; anchovies, 4 glassfuls; salt,  $1\frac{1}{2}$  tablespoonfuls. Put in a bottle, shake daily for a month, then decant.

2.—Sliced garlic, 8 oz.; cayenne pepper, 4 oz.; soy, 4 oz.; walnut catsup, 4 oz.; chopped anchovies, 36; vinegar, 1 gal.; powdered cochineal,  $\frac{1}{2}$  oz. Macerate for a month, strain, and bottle.

**Celery Vinegar.**—Finely shredded celery,  $\frac{1}{2}$  lb.; or celery seed,  $\frac{1}{2}$  oz.; good pickling vinegar, 1 pt.; salt, 1 level teaspoonful. Boil the vinegar, dissolve the salt in it, and pour the mixture over the celery or celery seed. When cold, cover, and let it remain undisturbed for 3 weeks, then strain into small bottles, cork securely, and store for use.

**Chilli Vinegar.**—Fresh chillies, 50; good pickling vinegar, 1 pt. Cut the chillies in halves; boil the vinegar, let it become quite cold, then pour it over the chillies. Cork closely, and store for use.

**Cider Vinegar.**—1.—Take, say, 10 gal. of new cider, and suffer it to ferment fully, which will probably be in about 2 weeks, if the weather be warm; then add about 8 gal. of new cider for producing a second fermentation, and in about 2 weeks add a like quantity to produce a third fermentation. Stop the bung-hole of the barrel with an empty bottle, with the neck downward, and expose to the sun. When the vinegar is come, set in a cool place. When making, let there be a moderate degree of heat and free access of external air. The process is hastened by adding to the cider a quantity of mother of vinegar, as it is called, a whitish, ropy coagulum, of a mucilaginous appearance, which is formed in vinegar, and acts as a ferment. The strength of the vinegar depends upon the amount of sugar or starchy matter to be ultimately converted into acetic acid. Cider made from late apples is esteemed the best for vinegar.

2.—Put some of the cider in a clean cask, and add to it some vinegar containing an abundance of mother of vinegar; after some days, if the acetic fermentation has taken place, and the souring is going on, add another portion of the cider, and at similar intervals a third and a fourth. When the whole has become vinegar, take out as much as is equal to the vinegar first put in, and replace by fresh

### (Vinegar)

cider, and so proceed. The casks should never be but partly full; good exposure to the air is necessary, and the temperature should be kept up to 86° F.

3.—Cider worked as malt vinegar.

**Cress Vinegar.**—Cress seed,  $\frac{1}{2}$  oz.; vinegar, 1 qt. Bruise the seed in a mortar, and put it into the vinegar, previously boiled and allowed to grow cold. Let it infuse for a fortnight, then strain, and bottle for use.

**Crystal Vinegar.**—Pickling vinegar, deodorized with freshly burned animal charcoal.

**Cucumber Vinegar.**—Cucumbers; vinegar to cover them. To each pint of vinegar allow 2 shallots, 1 clove of garlic, 1 teaspoonful of white peppercorns and 1 teaspoonful of salt. Boil the vinegar, salt and peppercorns together for 20 minutes, and allow the mixture to become quite cold. Slice the cucumbers, without paring them, into a wide-necked bottle or jar, add the shallots and garlic, and the vinegar when cold. Let the preparation remain closely covered for 14 days, then strain off into smaller bottles, cork tightly, and store in a cool, dry place.

**Culinary Vinegars.**—Black pepper vinegar, caper vinegar, celery-seed vinegar, chilli vinegar, cress-seed vinegar, garlic vinegar, ginger vinegar, horseradish vinegar, onion vinegar, red rose vinegar, Seville orange peel vinegar, shallot vinegar, truffle vinegar, white pepper vinegar, with several others of a similar kind, are made by steeping about 1 oz. of the respective articles in 1 pt. of good vinegar for 14 days, and straining.

**Currie Vinegar.**—Good currie powder,  $\frac{1}{2}$  lb.; vinegar, 1 gal.; infuse for a week. Used as flavoring.

**Curry Vinegar.**—Curry powder, 18 oz.; vinegar,  $1\frac{1}{2}$  gal.; infuse in a warm place 5 days. Used as a flavoring.

**Distilled Vinegar.**—Vinegar (preferably French), 8 parts; distil over with a gentle heat, 7 parts, and dilute the product, if necessary, with distilled water until the sp. gr. is 1.005.

**Ginger Vinegar.**—Bruised ginger root,  $\frac{1}{2}$  lb.; vinegar, 6 qt.; macerate 2 weeks, and strain.

**Gooseberry Vinegar.**—Bruised gooseberries,  $1\frac{1}{4}$  lb.; brown sugar,  $1\frac{1}{4}$  lb.; water, 1 gal. Other fruits may be substituted for gooseberries.

**Herb Vinegar.**—Fresh horseradish, taragon leaves, thyme, marjoram leaves, sage, mint and balm leaves, of each 1 oz.; shallots (one young), 4; vinegar, 1 qt. Macerate for a fortnight or more, and filter. Should have a green color.

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### (Vinegar)

**Horseradish Vinegar.**—Vinegar, 2 qt.; horseradish root, scraped, 6 oz.; minced shallots, 1 oz.; cayenne pepper, 2 dr. Let it stand for 2 weeks.

**Lemon Vinegar.**—Peel 12 lemons, squeeze out the juice, and allow to clarify in a vessel. Crush the peels, and pour 15 kgm. of good vinegar on the pulp obtained. Mix the clarified lemon juice in it, filter the whole, and keep in well closed bottles.

**Mint Vinegar.**—The mint for this purpose must be young and fresh. Pick the leaves from the stalks, and fill a bottle or jar with them. Cover with cold vinegar, cover closely, and let the mint infuse for 14 days. Then strain the liquor into small bottles, cork securely, and store for use.

**Mustard Vinegar.**—Celery, chopped fine, 32 parts; tarragon, the fresh herb, 6 parts; coarsely powdered cloves, 6 parts; onions, chopped fine, 6 parts; fresh lemon peel, chopped fine, 3 parts; white wine vinegar, 575 parts; white wine, 515 parts; crushed mustard seed, 100 parts. Mix, and macerate together for a week or 10 days in a warm place, then strain off.

**Orange Vinegar.**—Peel 2 oranges, squeeze out the juice, which is filled in a bottle, and allowed to settle. Crush the peels, and pour 15 kgm. of good vinegar on them, in a bottle; add the clear juice, and filter. The orange vinegar, which is now ready, should be preserved in well closed bottles.

**Pickling Vinegar.**—Ginger,  $\frac{1}{2}$  oz.; allspice,  $\frac{1}{2}$  oz.; curry powder, 1 oz.; black pepper, 2 oz.; capsicum,  $\frac{1}{2}$  oz.; mustard seed, 4 oz.; vinegar,  $4\frac{1}{2}$  pt. Bruise the spices, and macerate for 2 days in a warm place, with the vinegar, previously heated to boiling.

**Raisin Vinegar.**—One cwt. of the marc left from making raisin wine to every 12 or 15 gal. of water, along with a little yeast.

**Raspberry Vinegar.**—Ripe raspberries, 3 lb.; white wine vinegar, 3 pt.; loaf sugar. Put 1 lb. of picked raspberries into a wide-necked glass bottle, pour over them the vinegar, and let them infuse for 3 days. Strain the liquid through a hair sieve, drain the fruit thoroughly, but do not squeeze it. Pour the liquid over another pound of the raspberries, and after 3 days strain and drain as before. Repeat the process with the third pound of raspberries. Measure the liquid; to each pint allow 1 lb. of sugar; put the whole into a saucepan (preferably an enameled one), and boil gently for 10 min-

### (Vinegar)

utes, skimming when necessary, meanwhile. When quite cold, strain into small bottles, cork securely, and store for use.

**Shallot Vinegar.**—Good vinegar, 1 qt.; shallots, 4 oz. Remove the skins, chop the shallots finely, and put them into a wide-necked bottle. Pour in the vinegar, cork securely, and put the bottle aside for 10 days, during which time it must be shaken at least once a day. At the end of this time strain the vinegar through fine muslin, put it into small bottles, cork closely, and store for use.

**Spiced Vinegar.**—1.—Good vinegar, 1 pt.; black peppercorns,  $\frac{1}{2}$  oz.; whole ginger,  $\frac{1}{2}$  oz.; salt,  $\frac{1}{2}$  oz.; allspice,  $\frac{1}{4}$  oz.; finely chopped shallots,  $\frac{1}{2}$  oz.; cloves of garlic, bruised, 2; bay leaves, 2. Pound or crush the peppercorns, ginger and allspice, put all into a jar, add the rest of the ingredients, and cover closely. Let the jar remain in a warm place for 1 week, then place it in a saucepan containing boiling water, and cook gently for 1 hour. When cold, cover closely, and store for use. Requires 1 hour to cook.

2.—For Gherkins.—Good malt vinegar, 1 gal.; black peppercorns, 6 oz.; sliced ginger, 4 oz.; chillies, 1 oz.; garlic, in slices, 1 oz. Boil the spices and the garlic gently in half the vinegar for half an hour, strain through a sieve, and add the rest of the vinegar to the spices, and again strain. To the remnant spices add 2 oz. of salt and 1 pt. of water, and boil for half an hour. After removing from the fire add 1 pt. of vinegar, and again strain into the spiced vinegar, which, when perfectly cold, may be poured over the gherkins.

3.—For Pickles.—Malt vinegar, 1 gal.; crushed black pepper, 4 oz.; bruised ginger, 2 oz.; chillies, 1 oz.; nutmegs, 2 oz.; salt, 2 oz. Boil the spices in the vinegar, then macerate for 24 hours; strain, and add the salt.

4.—For Walnuts (to be used hot).—Good malt vinegar, 2 gal.; black peppercorns,  $\frac{1}{2}$  lb.; unbleached ginger, 6 oz.; mustard seed, 1 lb.; cloves, 2 oz.; mace, 2 oz.; garlic, in slices, 2 oz. In 1 gal. of vinegar boil the whole of the spices, and, having strained, pour the hot liquor over the walnuts; then boil the remaining gallon of vinegar and pour over spices, etc. This pickle takes some time to mature, but if properly prepared should be ready for use in 3 months.

**Strawberry Vinegar.**—Crush 1 kgm. of ripe strawberries into a mush, fill into a bottle, and pour 15 kgm. of good pure vinegar on it. Place the bottle, which



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must be closed with a tight cork, in a warm spot, and shake from time to time. After the mixture has stood for 6 to 8 days the vinegar is filtered, and kept in filled-up bottles in a cool place.

**Sugar Vinegar.**—Four pounds of brown sugar to each gallon of water.

**Tarragon Vinegar.**—Tarragon leaves intended for this purpose should be gathered on a dry day, about the end of July, just before the plant begins to bloom. Remove the stalks, bruise the leaves slightly, put them into a wide-necked bottle, and cover them with vinegar. Cover closely, so as to completely exclude the air, and let the bottle stand in a cool, dry place for 7 or 8 weeks. Now strain the liquid through fine muslin until it is quite clear, put it into small bottles, cork tightly, and store them in a cool, dry place. For estragon vinegar, substitute estragon for tarragon.

**Tarragon Vinegar Essence.**—(a) 20 parts by weight of tarragon oil and 30 parts of Maitrank essence are mixed with sufficient alcohol to make up 2,000 parts. About 1% of this mixture is added to 90% acetic acid. (b) 1,000 parts by weight of vinegar, to which 20 parts of alcohol have been added, are digested with 10 parts of fresh tarragon herbs, 10 parts of laurel leaves and 1 part each of nutmeg and cloves. This concentrated aroma is also added to the acetic acid.

**White Wine Vinegar.**—Acetic acid, 16 fl.oz.; tartaric acid, 1 av.oz.; acetic ether, 4 fl.dr.; white wine, 16 fl.oz.; water, 30 fl.oz.

**Wine Vinegar Essence.**—1.—To 10 parts by weight of cognac oil, 20 parts of acetic ether and 20 parts of Maitrank (May wine = wine flavored with woodruff) essence, sufficient alcohol is added to make up 1,000 parts, and 1 part of this mixture is mixed with 90 parts of 80% acetic acid.

2.—Cognac oil, 3 parts by weight, acetic ether 50 parts, pear ether 50 parts, alcohol q. s. ad 500 parts. About 2% of this mixture should be added to the acetic acid.

### MISCELLANEOUS PREPARATIONS

#### Baking Powder.

1.—A formula proposed by Crampton, of the United States Department of Agriculture, as the result of an investigation of the leading baking powders of the market, is: Potassium bitartrate, 2 parts; sodium bicarbonate, 1 part; corn starch, 1 part. The addition of the starch answers the double purpose of a "filler"

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to increase the weight of the powder and as a preservative. A mixture of the chemicals alone does not keep well. The stability of the preparation is increased by drying each ingredient separately by exposure to a gentle heat, mixing at once, and immediately placing in bottles or cans, and excluding excess of air, and consequently of moisture. This is not a cheap powder; but we cannot recommend any substitute. It is the best powder that can be made, as to healthfulness; there are others which, while cheaper, are strongly, and we are convinced, justly, opposed by sanitarians.

2.—Chloride of sodium, 320 parts; bicarbonate of soda, 240 parts; pure cream of tartar, 220 parts; white sugar, 120 parts; corn starch, 100 parts.

3.—Acid calcium phosphate, 2 lb.; powdered exsiccated alum, 2 lb.; sodium bicarbonate, 3 lb.; starch, 3 lb.

4.—**Baking Powder** is a leading one in the United States, and an analysis of it by the Agricultural Department shows it to have the following composition: Sodium bicarbonate, 23.61; residual sodium oxide, 1.59; ammonium bicarbonate, 0.98; potassium bitartrate, 53.34; calcium sulphate, 0.31; starch, 16.34; water, 3.83. It would appear from this that the powder may be made by mixing together 60 oz. of cream of tartar, 28 oz. of bicarbonate of soda, 1 oz. of carbonate of ammonia and 16 oz. of corn flour. A teaspoonful of the powder is added to each pound of flour.

#### Honey.

**Artificial.**—1.—White sugar, 5 lb.; water, 2 lb. Gradually bring to a boil, and skim well. When cool, add 1 lb. of bees' honey and 4 drops of peppermint. To make of better quality, add less water and more real honey.

2.—Soft water, 6 lb.; pure best honey, 3 lb.; white moist sugar, 20 lb.; cream of tartar, 80 gr.; essence of roses, 24 drops. Mix the above in a brass kettle, boil over a charcoal fire 5 minutes, take it off, add the whites of 2 eggs, well beaten; when almost cold, add 2 lb. more honey. A decoction of slippery elm will improve the honey if it be added while cooling, but it will ferment in warm weather and rise to the surface.

3.—Havana sugar, 15 lb.; water, 6 lb.; cream of tartar, 60 gr.; essence of peppermint, 15 drops; honey, 4½ lb. Dissolve the sugar in the water over a moderate fire, take off the scum; dissolve the cream of tartar in a little warm water; add, stirring; then add the honey, heated to

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the boiling point, then the essence of pepper-mint. Stir a few minutes; let it cool.

**Clarified.**—Refined Honey, Strained Honey.—Clarified honey is less agreeable than raw honey, but it is less liable to ferment. On the large scale, one or the other of the following plans is adopted:

1.—The honey is mixed with an equal weight of water, and allowed to boil up 5 or 6 times, without skimming; it is then removed from the fire, and after having been cooled, brought on several strong linen strainers stretched horizontally, and covered with a layer of clean and well washed sand, an inch in depth; the sand is rinsed with a little cold water, and the mixed liquor is finally evaporated to the thickness of syrup.

2.—Dissolve the honey in water, as last, clarify with white of egg, and evaporate to a proper consistency.

### Malted Food for Infants.

1.—Powdered malt, 1 oz.; finest ground oatmeal, 2 oz.; sugar of milk, 4 oz.; baked flour, 1 lb. Mix thoroughly.

2.—Baked wheat flour, 10 oz.; ground malt, 2 oz.; sugar of milk, 4 oz. There is no necessity to add phosphates. A more palatable food can be prepared by adding desiccated milk, but this, of course, is not essential, as fresh milk is always added before use. Dry all the ingredients before mixing, by spreading on large flat dishes in a moderately cool oven.

3.—This powder is to be added to the milk, and the liquid evaporated and powdered if a dry product is desired: Powdered malt, 1 oz.; powdered oatmeal, 2 oz.; sugar of milk, 4 oz.; roasted flour, 1 lb.

### Mince Meat.

For a small batch of mince meat about 5 lb. of beef will be required. It should be thoroughly boiled or stewed until it is very tender. Salt should be added to the water after it comes to a boil; this will insure that the meat is thoroughly seasoned. Boil away the water until it is practically all gone, being careful not to burn the meat; then chop fine, measuring it in a bowl; add 2 bowlfuls of chopped apples and 1 bowlful of chopped raisins to the meat. This should all be mixed together and set in a cool place. Mixed candied citron, lemon and orange peel are liked by many, and can be added to the raisins. Next, add 1 lb. of finely chopped suet, 1 tablespoonful of salt and 1 teaspoonful of cinnamon and allspice, or mace and allspice. Some cooks prefer to add a few cloves, but this spice is

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disagreeable to many people. Then add 1 lb. of sugar, two-thirds of a pint of molasses, and 1 qt. of boiled cider (see Index); put all in an enameled iron kettle, and let the mixture come to a boil. This results in the melting of the sugar and the suet. The mixture should be thoroughly stirred with a porcelain or wooden spoon. To make a brandied pie, add 1 large wineglassful of brandy to the mixture. The taste of the mince meat can be varied by adding liqueurs of various kinds; a cordial-glassful will be sufficient.

### Yeast.

**Yeast, Without Ferment.**—Boil  $\frac{1}{2}$  peck of malt in 3 qt. of water; pour off 2 qt., keep in a warm place 30 hours; add 4 qt. of a similar decoction, and stir well; again ferment, repeat the addition of 4 qt. until sufficient yeast is obtained.

**Berlin Yeast Flour (Baking Powder).**—Purified cream of tartar, 4 parts; carbonate of soda, 2 parts; flour, 1 part; also a mixture of 15 parts of tartaric acid, 16 parts of bicarbonate of soda, 16 parts of powdered starch and 2 parts of carbonate of ammonia. This will yield an excellent preparation, closely resembling Berlin yeast flour. The carbonate of ammonia may be omitted, but with it a much whiter bread can be made than where it is left out.

**Brewers' Yeast.**—Brewers' yeast is prepared as follows: Unkilned malt, 72 lb., and a handful of hops, are gradually stirred in a clean tub containing 7 gal. of water of 170° F.; and to this  $5\frac{1}{2}$  gal. of water of 200° F. are added. The tub is then covered tightly and left quiet. After some time it is cooled rapidly. This is accomplished by setting in cans filled with cold water. When the temperature of the mash has reached 70° the tub is covered again, and allowed to stand for 12 hours longer, when  $1\frac{1}{2}$  gal. of fresh beer yeast are to be stirred in. After another 12 hours have elapsed, pierce a hole in the layer formed by the husks of the malt, and dip  $3\frac{1}{2}$  gal. of the liquor beneath; then stir the whole up, and dip  $1\frac{3}{4}$  gal. from it (husks and liquor). This is the mother leaven, from which yeast can be generated all the year around by using it in the way described, instead of the ordinary beer leaven. To the remainder in the tub add 5 gal. of wort of 90°, and make use of it within 2 hours. The mother yeast also must be used the same day for fermenting another portion.

**Flour, Self-Raising.**—The following are

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the compositions of several of these powders in extensive use:

1.—Bicarbonate of soda, 23 oz.; burnt alum, 19 oz.; starch, 57 oz.

2.—Bicarbonate of soda, 24½ oz.; sesquicarbonate of soda, 2¼ oz.; starch, 47 oz.; burnt alum, 26½ oz.

3.—Bicarbonate of soda, 31 oz.; burnt alum, 29½ oz.; starch, 39 oz.

*Home-Brewed Yeast, British.*—Compound Barm or Malt and Hop Yeast.—Water, 20 lb.; malt, 5½ lb.; hops, 1½ oz.; salt, 1½ oz. Take a portion of the water, say 8 lb.; to this add the hops; set the vessel on the gas ring, and give a good boil up for a few minutes after ebullition sets in. Transfer this to a thoroughly clean wooden bucket and add the remainder of the water to get a temperature of 166° F.; then stir in the malt, which must be ground, well broken down, but not as fine as even coarse meal; then cover the bucket with ½ doz. bags to keep it hot, and let lie for 2½ hours. This operation is called "mashing," the mixture being called the "mash." When the "mash" has lain 2½ hours run it through a coarse flour sieve to separate out the grains; these grains must be pressed firmly between the hands to extract all the liquor possible. The liquor left is of a brown, muddy description, with a pleasant sweet taste and fine malty smell. This liquid, which is called "worts," is now run through a fine or hair sieve, is allowed to cool down to a temperature of 74° F.; it is then "stocked" or "stored" with 2 lb. of yeast from the previous brewing, the salt stirred in, and all set aside and allowed to ferment for 30 hours, at the end of which time it is ready for use. The hops are kept in the boiling water so that all the antiseptic principles may be abstracted, because it is this active constituent which controls bacterial action in the "worts" during the period of fermentation and helps to steady alcoholic fermentation and yeast growth. The temperature for mashing the malt, however, is the more important. A temperature of 166° F. is a little too high, but when malt has been stirred in the temperature will be found about 160° F., the ideal heat for the extraction of all that is valuable from the malt. As this temperature is a very important thing, it is always well in practice to use a wooden bucket, and to make the temperature much higher at first; the bucket will thus become thoroughly warmed before the temperature drops unduly, and so success is assured. The temperature must always be sufficiently high

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to gelatinize the malt starch, but it must not be high enough to destroy the malt diastase, otherwise the barm will be no good, because the yeast cells will have no food to live upon. The principle followed is to keep at a safe temperature for a fairly long period, when the whole change will have taken place. If the temperature falls below the gelatinizing point before all the starch has been acted on, then the proportion of yeast food will be so much less. If the mash drops to a lower temperature than the ideal, heat may be applied and the action restored again; but if in heating the mash, or in the first place adding the malt before the temperature of the liquor has been reduced to the proper figure, the mischief cannot be undone; the diastase is destroyed or weakened to such an extent that it is useless for the work of changing starch into sugar. When mashed sufficiently long the whole may be run into a barm press, and the grains pressed free from liquor. The worts, when finally stored, should be left alone until effervescence ceases, when it should be thoroughly stirred and the "store" taken out for the next brewing. While the yeast is fermenting it gives off a loud hissing sound, and it should not be used until this hissing finally ceases. This is not a quick-working yeast, but it is powerful. As a fermenting agent, malt and hop barm of yeast is very good indeed, and many old bakers say there is, even now, nothing to touch it for sweet-flavored bread.

*Preserving Yeast.*—1.—The thick portion of the yeast is filled into a champagne bottle, and on top of it is poured about ½ in. of olive oil. The bottle is then closed by tying a bladder over its top, and in order to protect it from explosion a pin is put through the bladder. So the yeast will keep well for a long time if stored in a cold place.

2.—Yeast, if mixed with about ⅓ pure glycerine, also keeps well for some time if in a cool place.

3.—The raw yeast is carefully washed with cold water, afterward the greater part of the water is removed by pressure; a further proportion is got rid of by means of a centrifugal apparatus; but as the yeast cannot be got perfectly dry in this way, it is afterward placed for that purpose in an apparatus in which a vacuum, or rarefaction of the air nearly approaching a vacuum, can be obtained. In this chamber the moisture, still combined with the yeast, evaporates at a very low degree of heat, and the vapor formed is immediately absorbed by hygroscopic sub-

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stances introduced for the purpose, as, for example, chloride of lime. The yeast is finally exposed to a current of air in its ordinary state, or dried, or of carbonic acid gas, according to the prevailing temperature and other circumstances. Through these manipulations a perfectly dry powder is finally obtained, which, being hermetically sealed in glass or tin cases, will keep perfectly well for several months. When required to be used, the powder is mixed with water to the consistency of a thin paste, which acts in the same way as fresh yeast.

4.—Reinke proceeds as follows for the preparation of yeast that will remain for months and years good for use in fermentation industries. About 2 oz. at a time of the well washed and thoroughly pressed pure-culture yeast is quickly enfolded in a dustless damp place in two sheets of blotting paper, sterilized by being kept, for 3 hours, at a temperature of 275° F. The yeast is then rolled flat, again wrapped in blotting paper (if necessary, sprinkled with boracic acid), and deprived of water by pressing between sterilized asbestos slabs. After changing the asbestos sheets several times the packages

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of yeast and the blotting paper, several together, are packed in tin boxes, the interstices being filled with burned gypsum (which absorbs the last traces of moisture) and the tin boxes soldered up. The removal of water from the yeast must be effected as rapidly as possible. (The process, unless most carefully conducted, will probably hardly ever yield satisfactory results.) The details are here given merely as a suggestion for experiment.

*Vienna Yeast.* Indian corn, barley and rye, all sprouting, are powdered and mixed, and then macerated in water at a temperature of from 149 to 167° F. Saccharification takes place in a few hours, when the liquor is racked off and allowed to clear, and fermentation is set up by the help of a minute quantity of any ordinary yeast. Carbonic acid is disengaged during the process with so much rapidity that the globules of yeast are thrown up by the gas, and remain floating on the surface, where they form a thick scum. The latter is carefully removed, and constitutes the best and purest yeast, which, when drained, and compressed in a hydraulic press, can be kept from 8 to 15 days, according to the season.



## CHAPTER XXII

# RUBBER, GUTTA PERCHA AND CELLULOID

### CELLULOID

*Properties of Celluloid.*—Crude celluloid, free from all additions of coloring matter, body colors or other substances designed for the production of special effects, is nearly colorless, and in thin layers is as clear as glass or faintly yellow, very elastic, transparent to translucent, hard, solid, nearly unbreakable, and can be cut with a knife or shears. It can be made harder or softer by suitable additions, though all attempts to render it soft and plastic like gutta percha have failed. Contrary to earlier statements, celluloid is not electrified by friction. Celluloid has a faint smell of camphor, this smell, which is not disagreeable, becoming stronger when the mass is rubbed and forming a means of identifying celluloid. Heated to 125° C. it becomes plastic, and in this state can be molded into any desired shape. Separate pieces will coalesce on mere contact when warmed. At about 140° C. celluloid suddenly loses its color and transparency, and at about 5° higher decomposes with liberation of pungent, readily inflammable vapors. Warm, plastic celluloid forms an excellent cement for metals, a property of considerable utility in the production of inlaid work. Celluloid softens in warm water, becomes flexible and somewhat plastic, so that it can be easily molded to any shape. This behavior, also, is very valuable in the manufacture of celluloid articles, since the molding process is greatly facilitated, loss of material is prevented and time is saved.

When ignited, celluloid burns with a smoky flame and more rapidly than sealing wax, a smell of camphor being apparent at the same time. When the flame is blown out shortly after ignition, the mass continues to glow briskly and to give off thick fumes of camphor that will soon darken the room. Undoubtedly the guncotton burns in this case at the expense of its own oxygen, but the temper-

ature is not sufficiently high to ignite the distilling camphor. This behavior indicates most clearly that celluloid is not a chemical combination of camphor and guncotton or collodion wool, since it is characteristic of chemical compounds that the substances entering into combination cease to exist independently in the compound. Celluloid can be ignited only by a naked light, and if heated in a vessel of any kind it simply decomposes, as already mentioned, at about 150° C., suddenly and completely, with the liberation of a good deal of smoke. In no case, however, is there any question of an explosion, for celluloid cannot be exploded either by pressure, shock, percussion, friction, heat or any other means. Celluloid is no longer guncotton, but a substance differing therefrom in all its properties. The property of celluloid of softening in hot water enables it to be cut into sheets of any desired thickness, and attach itself like putty, to wood, marble, etc. If two surfaces of celluloid be coated with collodion and pressed together, the two sheets, etc., will unite firmly to form a solid whole.

Celluloid is insoluble in water, and on this account is suitable for making domestic articles, such as knife handles. Though it is not directly attacked by concentrated sulphuric acid, it gradually dissolves therein in the cold, a small piece entirely disappearing in about 36 hours. It also gradually dissolves in concentrated nitric acid, and in boiling caustic potash.

The tensile strength of celluloid is very considerable. According to the results of a few crude tests, the elastic limit is about 200,000 to 240,000 lb. per sq. in., that of iron being 130 times as great, and that of wood about 7 times as great. The elasticity is also high, as can be demonstrated by an easy experiment. The tip of a celluloid hairpin, for instance, can be bent round until the two ends meet, and back again until the ends meet at the opposite side; and this can be done any number of times, the pin re-

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taining its original appearance when straightened out. To break off the tip it must be bent to and fro rapidly with considerable force. These simple tests clearly show the extreme elastic pliability of celluloid. The substance can be stained any desired color, and the coloring matter is not absorbed merely superficially, but permeates the whole mass—as can be seen from the fractured surface of celluloid articles. By means of suitable additions and treatment, celluloid can be made to imitate a large variety of materials, for which purpose it is largely used. In all conditions its surface is extremely smooth and lustrous; it can be sawn, filed and turned in the lathe, and in general treated like horny materials.

Celluloid can be rolled, polished, pressed, cut and hammered, and can also be kneaded at a temperature of 145° C., so that, occasionally, it may take the place of metals, stone, wood and wax. The specific gravity of celluloid varies according to the degree of pressure it has sustained in the manufacture, the mean being 1.5.

### Billiard Balls.

The process employed is as follows: To 100 parts of pyroxyline, dissolved, ground, and stained as usual, are added 300 to 500 parts of the solvent—alcohol, 100 parts; naphtha, 50 parts; 100 to 150 parts of arrowroot or starch; 50 to 200 parts of the best zinc white. The solid matters are added to the plastic solution of the pyroxyline, and the whole is placed in a closed rolling or grinding apparatus, the rollers being heated by steam, and the compound is ground up till most of the solvent is driven off. The latter is recovered by conveying it through pipes to a Liebig's condenser. The mass is now about as stiff as clay, and may be molded or rolled, and placed in a warm place for seasoning. When well seasoned, the ball may be turned. When less specific gravity is required, it is best to employ as much amylaceous substances as possible, they being lighter than the zinc. Ground and bleached cotton fiber may be rubbed up with the plastic pyroxyline, in the proportion of 100 parts disintegrated cotton to 300 parts pyroxyline paste. When making colored celluloid with amylaceous substances or cotton, the colors should be added at the same time, and ground up with the other ingredients.

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### Celluloid Without Camphor.

According to a French patent, plastic cellulose may be prepared from nitrocellulose by substituting naphthaline for camphor, whereby a great reduction in cost of production is effected. The formula gives these proportions: 1,000 parts of nitrocellulose, 600 parts of alcohol, 300 parts of acetone, 100 parts of naphthaline. The liquids named may be replaced by other solvents. The odor of the naphthaline disappears upon exposure to air.

### Coloring Finished Celluloid Articles.

Though celluloid is obtainable in a variety of colors, it is sometimes necessary to stain finished articles another color. As a rule, coal-tar dyes dissolved in spirit make excellent stains for this material; and for special purposes the following methods are recommended:

*Black.*—The article is dipped first in weak alkali, then in dilute silver nitrate, and left to dry in the sunlight.

*Blue.*—A solution of indigo nearly neutralized with potash is used, or a solution of Prussian blue; or a bath of ferric chloride followed, after drying, by one of potassium ferrocyanide.

*Brown.*—A solution of potassium permanganate, made alkaline with soda, is used.

*Green.*—The article is dipped in a solution of 2 parts of verdigris and 1 of sal ammoniac.

*Red.*—The articles are first dipped in water, slightly acidified with nitric acid, and then in an ammoniacal solution of carmine.

*Purple.*—Immersion in dilute chloride of gold, followed by exposure to strong sunlight.

*Yellow.*—The article is dipped successively into a solution of lead nitrate and one of yellow chromate of potash.

### Designs on Plates or Sheets of Celluloid, Xylonite, etc., Method for Producing.

The old method of producing patterns or designs on plates of celluloid, xylonite or similar plastic, nitrocellulose products, was by printing or pressing, with or without the assistance of warmth, or by molding and painting. A newer method consists in stamping a design in relief on sheets of white or yellow celluloid, then applying colors or paints, and finally imparting a polish to one or both surfaces by means of suitable rollers or plates, assisted by heat and pressure, this treatment bringing the pattern up more effec-

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tively on the polished surface of the sheet. The mordant and color can be applied to the printed plate by dipping the latter in a dye bath, whereby the coloring matter penetrates the hollows of the pattern and forms a thicker layer there than on the rest of the surface. The sheet is then subjected to powerful pressure, assisted by heat, between plates, which may be polished or not. The pressure and heat smoothen the engraved surface again and bring into admirable prominence the deeper portions which before were hardly noticeable. If one side of the sheet is to be polished, a polished plate is pressed against the portion that was not brought into contact with the dye, and this will bring the drawing up prominently on the polished surface, though it was actually impressed on the other. This polish can also be produced on the printed surface, or on both, the result in all cases being to bring out the pattern better. The impression can be imparted to the sheet by various means, such as wire, cloth, dies, rollers, etc.; and one on both sides of the sheet can be colored, all over or in parts, by either applying the color locally with a brush, or dipping the sheet in a dye bath.

### Glass Substitute.

Thin celluloid sheets can be stained superficially, on one or both sides, by dipping them in a bath of coal tar dye, prepared by pouring an alcoholic solution of the coal-tar dye into a bath of 99% spirit containing best white shellac and sandarac, or some other resin. This bath is acidified with boric acid, and shortly before use a little ether or benzol is added to accelerate the drying of the colored layer on the surface of the celluloid.

The celluloid sheets are immersed for a short time merely, this being sufficient to mordant and color the surface. The colored layer dries very quickly. If only one side of the sheet is to be stained, the other is first coated with asphaltum in the usual manner. These colored sheets are suitable for signals and identification devices, being unbreakable and fast-colored.

### Hardening and Softening Celluloid.

There is no method of hardening celluloid after it is made; if it is required hard, then 3 to 5% of rosin or shellac is mixed with the original pyroxyline for the manufacture of the celluloid. To soften the celluloid and render it flexible castor oil is used. Opaque celluloid may also be made much harder and more like

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ivory by the addition of mineral matter such as carbonate of lime or zinc oxide.

### Incombustible Celluloid.

1.—Mabille and Lerclerc patented a process for making a kind of incombustible celluloid. To a solution of celluloid is added a mixture of ether and alcohol containing iron salts. A clear liquid of the consistency of syrup results, and if the solvents are driven off from this, an incombustible non-inflammable celluloid remains. It would appear from the announcement that a chloride of iron is used, since it is stated that should the celluloid become heated the gases of the chlorine components would extinguish the flames.

2.—Non-inflammable celluloid is prepared by Asselot in the following manner: Ordinary celluloid is dissolved in 5 times its weight of acetone, and magnesium chloride in 3 times its weight of alcohol. The solutions are mixed in the proportion of 5 parts of the first to 1 of the second. A paste is formed, which is thoroughly mixed and dried.

*Polishing Celluloid.*—Make a kind of putty of hot soap, free from rosin, in which equal parts of fine pumice stone and flour emery have been mixed.

### Printing on Celluloid.

1. For ordinary lettering, etc., or showing up fine colored lines, celluloid may be printed in the usual way. The material, however, has to be specially prepared so as to obtain a matt or rough surface of suitable grain (by handwork, sandblast or other means), leaving, if necessary, certain parts of the surface intact. The sheet or plate is swilled with water or alcohol, to free the depressions from any clogging, adherent particles, and is then coated with a varnish made of 2 parts of boiled linseed oil, 1 part of white copal varnish, and 1 part of refined ethereal oil, preferably oil of turpentine or lavender. The varnished plate is wiped to force the varnish into the artificial pores of the grain and leave the surface bare, and is then covered for several hours with a mixture of equal parts of finely powdered magnesium and barium sulphates, after removing which it is carefully satined. This treatment gives a surface containing, enclosed in its innumerable fine pores, a very thin, almost transparent layer that exerts chemical attraction on the fatty bodies in printing ink and absorbs and retains them like paper. The most delicate drawings and shades of color can be printed



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on this surface without risk of running or clogging.

2.—According to F. Meyer (Bingen) celluloid printing is performed as follows: On the one hand, the desired pattern, etc., is printed on paper or like substance, and on the other, the celluloid is moistened with a known solvent, such as alcohol, ether, etc. On pressing the paper and celluloid together a portion of the ink on the former dissolves out and intimately mixes with the dissolved surface of the celluloid, thus forming a waterproof design.

3.—J. Artner's improvements in printing on celluloid relate more particularly to collars, cuffs and other washable apparel, with the object of protecting the applied colors from the perspiration of the body and friction with other clothes. In contrast to existing methods of printing celluloid, the method adopted is to coat the printed surface with a transparent film, protecting the colors from contact with perspiration, other clothing and from water in washing. The colors or designs are applied by rollers engraved in relief so that they are printed and pressed in at the same time. The celluloid articles are then dried, and coated by dipping in a warm, transparent hard-drying varnish which dissolves the surface of the celluloid and forms a coating that hardens on cooling so as to prevent the colors from rubbing off. This method can be applied to all celluloid articles, is simple and reliable, furnishing a product capable in a high degree of resisting external influences. The varnish used is a solution of copal in ether, with alcohol and water, and a trace of oil of turpentine, the proportions being: Copal dried at 100° C., 6.48%; alcohol, 16.40%; water, 1.20%; ether (sp. gr. 0.725), 75.17%; oil of turpentine, 0.45%. The copal is dissolved in the ether, the solution diluted with the alcohol and water, and the oil of turpentine added last. The ether has a slight solvent action on the celluloid and assists in binding the varnish, whilst the oil of turpentine prevents the varnish cracking off. The printed and varnished articles are finally dried at 50 to 55° C.

4.—Neupert (Altona) prints waterproof patterns on celluloid plates by graining the latter with equal parts of wax and potash, together with water, and oil of turpentine if too thick. A pattern applied to this surface by means of an alcoholic solution of coloring matter will partly dissolve the wax (by the alcohol and alkali together) and give a

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sharp impression. The case is parallel to the result obtained with sized paper in comparison with unsized, the dissolved color in the present case penetrating with the wax into the pores of the celluloid, whereas the color would run on the untreated celluloid.

5.—The Rheinische Gummi & Celluloidfabrik replace alcohol by acetic acid for dissolving the coloring matter, and thus dispense with a preliminary treatment of the surface. Probably this is due to the fact that this solvent attacks celluloid and thus penetrates it and dries therein at once. The running of the color on certain kinds of celluloid can be prevented by moistening the surface with oil of turpentine or melted paraffine wax.

### Solvents for Celluloid.

Celluloid dissolves in acetone, sulphuric ether, alcohol, oil of turpentine, benzine, amyl acetate, etc., alone, or in various combinations of these agents. The following are some proportions for solutions of celluloid:

1.—Celluloid, 5 grams; amyl acetate, 10 grams; acetone, 16 grams; sulphuric ether, 16 grams.

2.—Celluloid, 10 grams; sulphuric ether, 30 grams; acetone, 30 grams; amyl acetate, 30 grams; camphor, 3 grams.

3.—Celluloid, 5 grams; alcohol, 50 grams; camphor, 5 grams.

4.—Celluloid, 5 grams; amyl acetate, 50 grams.

5.—Celluloid, 5 grams; amyl acetate, 25 grams; acetone, 25 grams.

### Substitute for Celluloid.

A transparent, celluloid-like substance which is useful for the production of plates, tubes and other articles, but especially as an underlay for sensitive films in photography, is produced by dissolving 1.8 parts by weight of nitrocellulose in 16 parts of glacial acetic acid, with heating and stirring and addition of 5 parts of gelatine. After this has swelled up, admix 7.5 parts by weight of alcohol (96%), stirring right along. The syrupy product may be pressed into molds or poured, after further dilution with the said solvents in the stated proportion, upon glass plates to form thin layers. The dried articles are well washed with water, which may contain a trace of soda lye, and dried again. Photographic foundations produced in this manner do not change, nor attack the layers sensitive to light, nor do they become electric, and in developing, they remain flat.

## Rubber, Gutta Percha and Celluloid

### (Gutta-Percha)

#### Tortoiseshell, Imitation.

Celluloid constitutes the most suitable imitation of tortoiseshell that has ever been devised; imitations of this kind are supplied by celluloid makers as well as being made by consumers. Celluloid sheets employed for this purpose range from 1-25 to  $\frac{1}{4}$  of an in. in thickness. The ground color of real tortoiseshell is a faint brownish yellow, to imitate which the celluloid is stained with picric acid in the process of manufacture, by means of a solution containing a little aniline brown, picric acid by itself being too yellow. The reddish brown spots so characteristic of tortoiseshell are imitated by means of an alcoholic solution of aniline brown, with a little fuchsin to bring out the reddish tone. As celluloid is softened by strong alcohol, these solutions penetrate deeply into the mass. The sheets having been highly polished before applying the coloring, the luster removed by this latter operation is restored by diligent rubbing with woolen cloths. Articles of definite shape, like combs, etc., are not painted until the shaping process is completed. Incrustations of smooth-rolled metal wire, stars of thin leaf gold or silver for inexpensive cigar cases and purses, small fancy boxes, etc., are pressed into the mass as already described, the latter being then smoothed, polished and finally colored. When the coloring is applied by a skilled operator, it is hardly possible to distinguish the imitation from the genuine tortoiseshell by the appearance.

#### White Celluloid.

For producing a white celluloid, without unduly increasing its specific gravity, the dissolved pyroxyline and other ingredients are mixed with white starch, either from wheat, rice, potatoes, etc., or with arrowroot, tapioca, or other amylaceous substance, or with wheat flour, or with cotton ground and bleached.

#### Working Celluloid.

In general celluloid is worked the same as horn or ivory. In turning the tool should be kept cool with water. In case the work tears, heat the celluloid in water until 90 to 100° F. are reached.

### GUTTA PERCHA

The Properties, Manufacture and Uses of Gutta Percha and Balata are treated of in the Scientific American Supplement, Nos. 1116, \*1156, 1417, 1575 and 1800. (\*) refers to illustrated article.

1.—*Difference Between Gutta Percha and Rubber.*—These two substances are

### (Gutta-Percha)

constantly confused. A standard work on the subject shows the difference by means of the following comparison in double columns:

INDIA-RUBBER (Gum elastic)	GUTTA PERCHA (Gum plastic)
Raw rubber is soft and malleable when heated, but is still elastic within a certain range of temperature.	In boiling water, becomes plastic and malleable, and if then shaped, preserves its form when cold.
Acted on by air, becomes viscous.	Acted on by air, becomes brittle and resinous, but not so quickly as rubber.
Chief applications are in the sulphur-vulcanized condition.	Will not combine or intimately mix with sulphur.

2.—*Bleaching.*—Dissolve it in 20 times its weight of boiling benzine, and add plaster of the best quality to the solution, shaking from time to time. In a few days' time the plaster will have settled to the bottom, carrying with it the impurities soluble in the benzine. Decant the liquid and introduce it in small portions into a vessel containing double its volume of 90% alcohol, stirring continually. During this operation the gutta percha precipitates in the form of a perfectly white pastelike mass. The drying of the gutta percha thus purified requires several weeks' exposure to the air; this may be accelerated by triturating it in a mortar, and removing from it the water that separates.

3.—*Cementing Cloth, Gutta Percha Tissue for.*—Tailors use a special preparation of gutta percha for this purpose, consisting of a thin tissue, placed between layers of the cloth and pressed with a hot iron. Used extensively to fasten the bottom edge of trousers.

4.—*Liquid Gutta Percha.*—This useful preparation is to be found in the United States Pharmacopœia, and is made thus: Gutta percha in thin slices, 1 oz.; chloroform, 8 fl.oz.; carbonate of lead, in fine powder, 1 oz. Add the gutta percha to 6 fl.oz. of the chloroform in a stoppered bottle and shake them together frequently until the solution has been effected. Then add the carbonate of lead previously mixed with the remainder of the chloroform, and, having several times shaken the whole together, set the mixture aside and let it remain at rest until the insoluble matter has subsided. Lastly, decant the clear liquid and keep it in a well-stoppered bottle. 1 part of this solution in 10 parts by weight of chloroform produces an excellent and convenient preparation for painting over cuts or

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wounds. It readily acts as a styptic and protective to the wound and causes neither tension nor pain. If pure iodoform be added, about 10%, it further enhances the value of the styptic and can be used in veterinary surgery with marked success for applying to cuts and abrasions, as it arrests hemorrhage, forms a coating over the wound and promotes a healthy cicatrization.

5.—*Melting Gutta Percha.*—The gutta percha may be dissolved by adding bisulphide of carbon; if the liquid thus obtained is poured upon glass, after a short time the gutta percha may be lifted in the form of a thin sheet, the bisulphide evaporating very quickly.

6.—*Plastic Gutta Percha.*—When gutta percha is steeped for a few hours in benzole or naphtha it becomes considerably swollen; if afterward soaked in hot water, it is exceedingly plastic and requires but moderate pressure to obtain most perfect copies from even such fragile objects as plaster-of-paris models.

7.—*Substitute (Sorel).*—a.—Pitch, 18 parts; calcium hydrate, 9 parts; gutta percha, 24 parts.

b.—Coal tar, 18 parts; calcium hydrate, 9 parts; gutta percha, 24 parts. Used for manufacturing waterproof articles, tubes, machine belts, waterproof boots and shoes, etc. If greater tenacity is desired, add cotton, wool or hemp.

### RUBBER

**Rubber, Its Chemistry, Curing, Manipulation in the Manufacture of Goods, Tires, etc., Utilization of Waste, Reclaiming, Substitutes, etc.** (See the Scientific American Supplement, Nos. 1204, 1231, 1791, \*1271, \*1767, \*1768, 1135, 1385, \*1456, \*1457, 1613, 1386, 1665, 1355, \*1070, 1801 and 1802. (\*) refers to illustrated articles.

### Artificial.

These compositions include artificial caoutchouc, artificial leathers, celluloid, viscid, and other derivatives of cellulose, and plastic masses obtained from casein, malsin, gelatine, albumen and various other substances.

*Caoutchouc.*—1.—Waste scraps of vulcanized india-rubber are pulverized and mixed with a solution of calcium sulphide and tar. The mixture is heated from 24 to 60 hours in a closed digester to dissolve out the sulphur added in vulcanizing, and the tar is distilled off at reduced pressure. The mass is then stirred and washed with hot water.

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2.—Neilson regenerates vulcanized rubber by treating it with oil of rosin at from 400 to 570° F.

3.—Ducastle and Alexander employ benzene and solution of soda.

4.—Groetz employs aniline, alcohol, bisulphide of carbon, etc., and precipitates the caoutchouc from the solution of amyl alcohol (fusel oil) methyl alcohol (wood alcohol), or acetone.

5.—Imitations of caoutchouc are also made from oils, for example by treating a drying oil with monohydrated nitric acid and washing the resultant nitro compound, or by combining the oil with sulphur or chloride of sulphur.

6.—Werbeck prepares a paste of gelatine, phosphate of lime, tannin and bituminous oil, and mixes it with olein soap to produce an imitation of caoutchouc.

7.—Lesage uses gelatine coagulated in glycerine and adds a solution of genuine caoutchouc.

8.—Lusenia di Rosa employs gelatine coagulated by tannin and mixed with castor oil, ether, and fulminating cotton. The mixture is then treated with carbon dioxide of acetylene, and finally evaporated.

9.—An elastic mass, similar to caoutchouc, from which rubber is made, can be produced by combining sodium tungstate with certain organic substances. If tungstic acid or sodium tungstate is added to glue and then hydrochloric acid, a tungstic glue is produced which, at 85 to 105° F., is so elastic that it may be drawn out into very thin fibers. By cooling, this mass becomes very firm and brittle. This product may be used for mordanting specially for aniline dyes. It was also employed for tanning leather, but turned with it as hard as stong, for which reason it has not entered greatly into use.

10.—Pure caoutchouc, 1,000 grams; pure amianthus, with sulphur in proportion, 10 to 30%. 5 to 10% is sufficient for the production of an elastic substance; from 10 to 20% for a semi-flexible article; and 25 to 65% for a hard product. The mixture is made with heat in a suitable mixing machine; the caoutchouc cleaned and purified, and the amianthus and sulphur pulverized and sifted. The heating is done preferably inside a cylinder, and it ought to be continued until a perfect mixture is obtained. The dough formed by this mixture is drawn out into sheets or molded according to requirements. The formula

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given above is not in sufficient detail to enable the process to be worked.

**Rubber Substitutes.**—Since India-rubber first became of value through vulcanization, it has been the dream of experimenters and inventors to produce it artificially. One of the most persistent seekers after a substitute for the natural gum was the late Austin G. Day, who tried hundreds of experiments and took out many patents. As far back as 1866 he made public the results of some of his work, giving as formulas for rubber substitutes the following compounds:

1.—Linseed oil, 2 lb.; cotton-seed oil, 1 lb.; petroleum, 2 lb.; raw turpentine, 2 lb.; sulphur, 2 lb. Boil 2 hours.

2.—Linseed oil, 2 lb.; cotton-seed oil, 1 lb.; petroleum, 1 lb.; raw turpentine, 2 lb.; castor oil, 1 lb.; sulphur, 2 lb. Boil  $\frac{1}{2}$  hour.

3.—Linseed oil, 2 lb.; cotton-seed oil, 1 lb.; petroleum, 1 lb.; raw turpentine,  $\frac{1}{2}$  lb.; liquid coal tar, 3 lb.; peanut oil, 1 lb.; spirits of turpentine, 1 lb.; sulphur, 4 lb. Boil 35 minutes.

4.—Linseed oil, 2 lb.; cotton-seed oil, 1 lb.; petroleum, 2 lb.; raw turpentine,  $\frac{1}{2}$  lb.; liquid coal tar, 2 lb.; spirits of turpentine, 1 lb.; rubber, 1-6 lb.; sulphur, 2 lb. Boil 1 hour.

5.—In 1871 Mr. Day had brought his experimenting down to the following formula: Cotton-seed oil, 14 lb.; linseed oil, 14 lb.; asphaltum, 8 lb.; coal tar, 8 lb.; sulphur, 10 lb.; camphor,  $\frac{1}{2}$  lb. In this the tar and asphaltum were first mixed with the cotton-seed oil, after which was added the linseed oil and camphor, and, last of all, the sulphur, when the temperature was about 270° F.

6.—A substitute designed to be used in rubber compounding in place, say, of reclaimed rubber, was made as follows: Cotton-seed oil, 27 lb.; coal tar, 30 lb.; earthy matter, 5 lb. To be mixed, and heated to 300° F., and then strained, and cooled to 200° F. Then were added 27 lb. of linseed oil, the heat raised to 220° F., and 15 to 18 lb. of sulphur added, the heat being continually raised until the mass was sulfurized. When the heat reached 240° F., 1 to  $\frac{1}{2}$  oz. of nitric acid were added, and at 270 to 280° F. from 1 to 3 oz. of camphor were added to help the sulfurization. The resultant compound was used on the following basis: Para rubber, 20 lb.; litharge, 5 lb.; sulphur, 1 lb.; above compound, 20 to 40 lb.

7.—Another curious line of substitutes is that based upon the use of glue and glycerine. Some of these have uses, while

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others, that look very attractive, are of no use at all, for the simple reason that they will absorb water almost as readily as a dry sponge. The first of these is more than 30 years old, and is said to be of French origin. The formula is: Glue, 4 lb.; glycerine, 8 oz.; nutgall, 3 oz.; acetic acid, 1 lb., in 5 lb. of water. Ten years later this was approached by an English formula in which, in place of the nutgall and acetic acid, chrome and tannic acids were substituted, and a modicum of ground cork was added, as a cheaper, probably. Some four years later an ingenious Prussian gave out a formula in which to the glue and glycerine and tannic acid were added Marseilles soap and linseed oil. None of the above have ever had a commercial value, the nearest approach being the glue and glycerine compound used as a cover for gas tubing. The substitutes that have really come into use generally are made either from linseed, cotton-seed or maize oil. Scores of these have been produced, and thousands of dollars have been spent by promoters and owners in trying to make these gums do just what crude rubber will. A German formula that cost certain American investors thousands of dollars, and which for a time looked as if it was going to be generally adopted, was: Linseed oil, 80 lb., lime-hardened rosin, 50 lbs., in solution; add to above, sulphur, 8 lb.; linseed oil, 42 lb.; add 20 lb. of sulphur, and heat to 375° F. This gum, although used quite largely at one time in the United States, France and Germany, is not manufactured now.

8.—W. Lascelles-Scott, a distinguished English chemist, when on a visit to the United States to examine the Keely motor, called attention to some very interesting formulas of his own for the manufacture of substitutes. For example, his soap substitutes were certainly original. They were:

a.—Linseed oil, 28 lb.; sulphur, 8 lb.; aluminum soap, 28 lb.; oil of turpentine, 4 lb.

b.—Aluminum soap, 15 lb.; almadina, 25 lb.; caoutchouc, 50 lb.; sulphur, 6 lb.; oleum succini, 4 lb.

9.—In others he mixed reclaimed rubber dust with hardened rosin and bitumen; also with precipitated cellulose. One of the most interesting was a compound of linseed oil, sulphur, mineral caoutchouc and Russian petroleum. Whether or not any of these are in use it is impossible to state. There are, however, hundreds of tons of rubber substitutes sold and used annually. About one-half of what is used

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is made in the factories for private consumption. The other half is manufactured for the trade by supply houses. As a rule, this is made of one of the three oils named above, and may be generally divided into two grades: (1) the brown (or black) and (2) the white. The former is made by heating one of the fatty oils with sulphur; the latter is made by treating the oil cold with sulphur chloride. The substitutes on the market vary somewhat, of course, as they may be made from raw oil, or from "blown" oil, or it may be that the purchaser gets an oil that has been adulterated without his knowledge, which will make a difference in the product. As a rule, however, those who are furnishing the trade are giving a good article.

#### Belts, Rubber Preservative.

**Dressing for.**—Cut india-rubber into small pieces and dissolve with 5 parts by weight of turpentine oil in a small iron well-covered crucible at a temperature of 50° C. (122° F.) over a coal fire. As soon as the rubber is dissolved, add 4 parts by weight of rosin, stir, remelt, and add in the same way 4 parts by weight of yellow wax. While melting the mixture must be occasionally stirred. Then put 15 parts by weight of fish oil and 5 of tallow into a sufficiently large vessel, heat till the whole is melted, and add the first mixture warm, stirring all the while. Continue stirring till the mass is compact. The dressing should be used in the following manner: If the belts are old and brittle, apply the dressing freely with a brush on both sides in the sun or in a warm room and leave them to dry. New belts, or belts that are still good, should like the previously treated brittle belts, be lubricated a little on the inside from time to time while in operation; in this way they will be rendered very durable, and will engage well on the pulleys, drums, etc. Cheap, old rubber waste can be used instead of india-rubber; it should first, however, be boiled for a quarter or half an hour in soda lye, and 6½ parts by weight instead of 5 should be taken.

#### Corks, Rubber, To Cut and Bore.

1.—Dip the knife, or cork borer, in solution of caustic potash or soda. The strength is of very little consequence, but it should not be weaker than the ordinary reagent solution.

2.—Alcohol is generally recommended, and it works well until it evaporates, which is generally long before the cork is

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cut or bored through, and more has to be applied; water acts just as well as alcohol, and lasts longer. When, however, a tolerably sharp knife is moistened with soda lye, it goes through the india-rubber quite as easily as through a common cork; and the same may be said of a cork borer, of whatever size. We have frequently bored inch holes in large caoutchouc stoppers, perfectly smooth and cylindrical, by this method. In order to finish the hole without the usual contraction of its diameter, the stopper should be held firmly against a flat surface of common cork until the borer passes into the latter.

#### Covering Cloth with Rubber.

To cover cloth with rubber, naphtha, alcohol and benzole are chiefly employed for dissolving the rubber. They are mixed with purified solid paraffine and ground together.

#### Deodorizing Rubber.

1.—Place the articles, covered with charcoal dust, in an enclosed vessel, let them remain for several hours at a temperature of 94° F. Clean the charcoal dust from the articles; they will be odorless.

2.—Caustic potash, ½ oz.; water, 1½ pt.; dissolve and heat to boiling. Put the goods into this for a few minutes, rinse thoroughly and dry.

3.—Both sides of the article should be covered with a thin layer of animal potash. Heat for 3 or 4 hours from 122 to 140° F.

4.—Equal parts of alcohol, 36%, and linseed oil, shaken together thoroughly. Apply to the hose with a cloth. Stretch the hose a little, and rub until nearly dry. Repeat 3 or 4 times at intervals of several days. This treatment renders the hose gastight.

5.—Treat the rubber with solutions of caustic potash or caustic soda; treatment with potash or soda, since caustic potash and caustic soda injure the rubber; boil with alkaline soaps; boil with leucic phenix—calcined soda with water glass; and lastly, after treatment with soda, leave the rubber for some time in a solution of cooking salt (10 to 15%).

#### Dissolving Rubber.

The solution of india-rubber or gutta percha in chloroform or benzole, frequently called for in photographic work, is usually attended with so many difficulties and drawbacks that in nine cases out of ten where the solution is required the

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experimentalist usually purchases it ready made. Yet there need be no difficulty about the matter. First, pure rubber should be obtained. When vulcanized, it is perfectly insoluble. Secondly, pure solvents are necessary. Chloroform containing a large excess of alcohol and water will fail to act even upon the purest rubber. Again, under the most satisfactory conditions, the action is very slow, and the amount of rubber capable of being taken up is proportionately very small. The plan usually adopted is to place a large amount of shredded rubber in a bottle, which is then filled up with the solvent, and shaken at intervals a few times; and when the shreds do not dissolve like pieces of sugar the whole is thrown aside, and we are written to for an explanation of the failure. If a small quantity of rubber had been placed in the bottle, and the liquid added, it would have been observed gradually to swell out very considerably after the lapse of some time, and a mixture of the whole would be facilitated by stirring with a glass rod or a splinter of wood. The rapidity with which the rubber absorbs the solvent will depend upon its condition; but the action is never very quick, nor is it in any way analogous to the dissolution of a crystal. One cause of the failure of chloroform to act upon the caoutchouc may arise from the presence of alcohol in too great a proportion. Chloroform as sold almost always contains alcohol in small quantity, owing to the fact that when none is present it cannot be prevented from decomposing spontaneously, more especially in the light. It is, however, stated that when entirely protected from light absolute chloroform will not undergo any change. A solution of gutta percha in chloroform has a use which is not generally known. It forms, when carefully made and filtered quite bright, the best possible material for obscuring glass for focussing screens. For fine microscopic work it is said by those whose opinions are of weight to be unequalled.

### Durability of Rubber Goods, To Increase.

A great disadvantage of rubber goods consists in their becoming brittle or sticky very quickly. For the purpose of rendering them soft and elastic again, prepare a moderately strong solution of alum in water, into which lay the rubber articles for a day or two; after that time they are no longer hard or sticky. It is of great advantage for all rubber goods, if seldom used, to be kept in clean water;

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this will greatly increase their durability. If the objects are not easily placed under water, as for instance, bicycle tires and similar bulky pieces, it is well to wash them from time to time with water to prevent them from becoming too dry. In this connection it is well to mention that it is harmful for the tires to be tightly inflated over winter and the rubber to touch the floor; the bicycle should rest on a stand or be suspended. Moreover, it should be kept in a dark room in as even a temperature as possible, or at least be provided with a covering of cloth, since air and light exercise an equally destructive action upon rubber.

### Ebonite and Vulcanite.

These two materials are practically the same substance, the main difference being in the coloring materials used. They consist of india-rubber and sulphur, practically the same as vulcanized india-rubber, but a greater heat, and time, are employed to vulcanize the compound. To prepare it as sold in the form of combs, toilet and fancy articles, the rubber is worked in a masticating machine with the proper quantity of sulphur, and when thoroughly mixed a sufficient quantity is put into a mold of the right shape made of plaster of paris, or other material which will not combine with sulphur, and exposed in a steam boiler to a heat of 315° F., and a pressure of about 12 lb. to the inch for 2 hours. It is then removed from the mold, and finished, and polished exactly in the same manner as ivory. The application of heat as above without a steam pressure is sufficient to vulcanize or harden the compound, but the result is not always so satisfactory, as the material is liable to be porous, if not compressed while hardening. Gutta percha may be treated in exactly the same manner as rubber, and cannot be distinguished from it, but is rather more troublesome to work. The vulcanite may be turned or carved in the same way as ivory, with the advantage that it may be molded to the required form without the great waste which attends ivory carving. It is also much less liable to fracture. The smaller the proportions of sulphur in the rubber, and the lower the temperature used, the softer and more elastic will be the rubber. About 10 or 15% of sulphur and a temperature of 270 to 275° F. for 4 hours, will make an elastic rubber; 30% of sulphur and a temperature of 315° F. for 2 hours will make a hard vulcanite like ivory.

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**Ebonite.**—1.—Sulphur, 2 to 3 parts, is mixed with caoutchouc, 5 parts, and cured for several hours at 75° C., under a pressure of 4 to 5 atmospheres. Ebonite is apt to become porous and conductive in moist air or in sunlight. It keeps best when dry and in the dark. Heat softens and deforms it. To prevent loss of insulation by oxidation of the sulphur, the surface should be washed from time to time with boiling water, then rinsed with distilled water, and dried. The surface should be shellaced or paraffined, especially in moist climates.

2.—Hard Good Quality.—Best Para rubber, 2 parts; sulphur, 1 part, by weight.

3.—American Ebonite.—Rubber, 12 parts; sulphur, 8 parts; whitening, 1 part; wash, 1 part, by weight. Curing molds for above; lead, 2 parts; antimony, 1 part, by weight.

4.—Hints on Working Ebonite.—a.—The following are useful hints, which appeared in the *American Machinist*, relating to the working of ebonite:

The best qualities show on fracture a brightness something of the nature of jet, and the poorer sorts a corresponding dullness. Although an apparently easy material to machine, its wearing effect on cutting tools is comparatively great. In sawing, turning, planing, or milling, the best speed is that at which brass is machined, and milling should always be accompanied by the free use of soap and water, having regard to the fact that a milling cutter is an expensive tool; but for turning or sawing, lubricants are in the way, on account of the splattering round of ebonite cuttings and soapy water.

b.—Turning.—When turning ebonite it is always preferable to leave the tools dead hard with a lot of "rake" on, and to take as deep a cut as possible, with a slow feed. Herein will be found the advantage of the tool-holder system for turning tools, in which the cutter can be taken out and replaced by a fresh one, saving thereby a good many journeys to the grindstone; for the moment a cutter becomes dull, which is frequent, instead of cutting it "burns" the surface of the material, and, of course, militates against the production of good work.

c.—Lubricants.—When tapping ebonite soft soap has been found to be the best lubricant.

Oil should never be used as it works into the material and in time rots the thread. Taps made of rod brass will be found useful, for if a dozen or two holes are executed with an ordinary tap, it will

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be comparatively useless on metal. Brass taps are easily made, and last almost as well as steel. Reamers of brass can be used in the same manner; an ordinary nose type with four saw-slits made in the end, and a tapped hole admitting a taper screw for expanding the tool as it becomes worn, is as handy and as cheap a method of reaming holes in ebonite as the writer knows of. When worn, it can be headed up easily and made ready for use again. In shops where ebonite is used it is nearly always found necessary to do a lot of sawing, and it will be found best not to use expensive tools. Good saws—properly ground for clearance—are often rendered useless after a day's work on this material, and home-made sheet-steel saws are as good as the more expensive ones for cutting, besides being more readily sharpened, the necessary clearance being given to them by setting the teeth over sideways. Although of a brittle nature, the thinnest sheets can be worked in the press up to a thickness of about .02 in., keeping the tools and materials warm by means of a gas-jet, and, although the stampings come out rather rough on the edges, they will be found suitable for jobs where a smooth edge is not desired.

d.—Polishing.—In polishing ebonite, after taking all tool-marks out with emery paper (commencing with F.F. and finishing with No. 1 blue-black French paper), a lap of hard felt charged with bath brick and oil is used, after which another lap charged with rotten stone and oil will be found to give good results: at the same time taking care not to exercise too much pressure, for an excess of friction "burns" the surface of the ebonite, rendering it incapable of taking a high polish. If a dead finish is desired, all that is necessary, after using the emery cloth, is for the surface to be rubbed over with a cloth dampened in paraffine.

**Vulcanite.**—1.—About equal parts of rubber and sulphur are used, to which is added about 7 to 10 per cent. of lamp-black. These are all worked together in the masticating machine. A very useful vulcanizer for small goods is that made for dental work. It usually takes the shape of a cylindrical iron vessel with bolted-on lid, and fitted with a pressure gauge, thermometer, and safety valve. Perforated divisions are put inside for the articles to rest on. With the simple vulcanizers the required heat is obtained by putting a little water in the bottom of the vessel, then lighting a burner underneath to create steam which soon reaches a high pressure and temperature. The safety-

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valve is set to blow off at the proper pressure. Larger vulcanizers are steam-jacketed, which is no advantage except where high-pressure steam is available. The heat for vulcanizing should be slowly raised, the whole process being extended to about 4 hours, the final and highest temperature being 150° C. (302° F.). In large works the vulcanizing chamber is a horizontal cylindrical oven with a door in one end, free high-pressure steam being used, supplied to the interior (without a jacket.) It may be explained that the pressure and temperature of steam go together, and for 302° F. the steam pressure would be 55 lb. on the gauge.

2.—(Of Gitschin.)—Thirty-six parts of nitrate of potash, 19 parts nitrate of soda, 11 parts sulphur, 9 parts sawdust, 9.5 parts chloride of potash, 6 parts wood-charcoal, 4.5 parts Glauber's salt, 2.25 parts red prussiate of potash, 2.35 parts sugar, 1.25 parts picric acid.

3.—Polishing.—a.—Remove scratches with a smooth wet water-of-Ayr stone, and then polish in the lathe with fine pumice and a stiff brush. After washing the pumice off, polish it with whiting and soft brush.

b.—The mathematical instrument makers treat it as brass—that is, for flat work they first use water-of-Ayr stone, and then rotten stone and oil. Turned work is polished in the lathe with rotten stone and oil, taking care not to use too high a speed, which would heat the work. Some use lampblack and oil to finish with where a very high polish is wanted, or the bare palm of the hand, as in getting up silver plate. Chain and ornament work, made of sealhorse-leather, and for work of irregular forms, buffs of calico. A number of pieces of calico, 12 in. in diameter, are screwed together between flanges, like a circular-saw spindle, and used with rotten stone, always taking care not to heat the work; brushes are not at all suitable for it.

c.—To polish turned vulcanite which has been finished with a scraping tool, take a handful of vulcanite shavings, and apply these as the article revolves. Next prepare a piece of soft linen (a surgical bandage will do) by soaking in any sort of common oil, and sprinkle one side with putty powder (oxide of tin), then loop the prepared side round the article, holding the ends firmly with both hands, and work it evenly all over the article while the lathe is running, and finish the polishing in the same manner with a clean piece of linen without polishing medium.

4.—Soft Vulcanized India Rubber.—

### (Rubber)

Para rubber, 7.5 parts; sulphur, 0.75 part; lime, 0.01 part; whiting 7.5 parts; French chalk, 1.25 parts; litharge, 1.5 parts, by weight.

5.—Vulcanizing Rubber.—Parkes' method is now sometimes adopted. The caoutchouc is immersed in a mixture of 39 parts of bisulphide of carbon and 1 part of chloride of sulphur. It is next placed in a room heated to 70° F., and when all the sulphide of carbon has been volatilized, the process is so far complete that it is only requisite to boil the material in a solution of about 18 oz. of caustic potassa to 2 gal. of water, the vulcanized caoutchouc being next washed to remove excess of alkali.

6.—Working Vulcanite.—Vulcanite can be worked with ordinary wood-cutting, sawing or turning tools, as it works much like ivory. It is desirable to keep vulcanite cool when working it, as it heats rapidly and softens with heat. At the boiling point of water vulcanite can be bent and, when cold, will retain its new shape. At a little higher temperature vulcanite is soft enough to be impressed with a pattern, or to be molded.

### Joining Rubber.

Rubber is easily joined, and made as strong as an original fabric, by softening before a fire, laying the edges carefully together, without dust, dirt, or moisture between. The edges so joined must be freshly cut in the beginning. Tubing can be united by joining the edges around a glass cylinder, which has previously been rolled with paper. After the glass is withdrawn the paper is easily removed. Sift flour or powdered soapstone through the tube to prevent the sides from adhering from accidental contact.

### Marking Prices on Rubber Combs.

Scratch the price in small figures or letters on the back or side of the comb with some sharp-pointed instrument, preferably a darning needle. A white ink may be made for the purpose by suspending a sufficient quantity of zinc white or other pigment in a mixture of dextrine 30 parts, glue 10 parts, water 60 parts (or a sufficient quantity).

### Nipples, To Pierce.

Levy recommends the following method to put small holes, preferably three to four, in the nipples in a simple and practical manner, so that the milk does not enter the baby's mouth direct, but only by means of sucking motions. Take a little pointed piece of wood, for



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### (Rubber)

instance a toothpick, introduce it into the top of the nipple consisting of soft rubber, and push it up so that a fold of about  $\frac{1}{2}$  to 1 cm. results. Next, the point of the pick is cut off, together with the thinly stretched out rubber layer, by means of a sharp scissors. In this manner a sharp-edged hole of the same size as in the feminine breast is obtained. Repeat the process according to the number of holes desired.

### Ornamentation of Rubber Articles.

Use oxidized, preferably atmospherically dried oil varnish. Oil varnish colors must therefore not be applied directly to the rubber, but first to a conveniently flexible basis (paper, fabric, etc.), which is protected against the penetration of the varnish by a coating of starch, albumen, glue, etc. The designs thus produced are completely dried in the air, then the dried colors are softened by moistening with volatile hydrocarbons, that dissolve rubber, like benzole, naphtha, etc., and pressed against the similarly softened surface of the unvulcanized rubber. After the evaporation of the solvent, the backing of the colors is removed. Vulcanize the rubber.

### Preserving.

1. The hardening of the vulcanized india-rubber is caused by the gradual evaporation of the solvent liquids contained in the india-rubber, and introduced during the process of vulcanization. Guided by this notion, experiments have been made for a number of years in order in order to find a method for preserving the india-rubber. It is now found that keeping in an atmosphere saturated with the vapors of the solvents answers the purpose. India-rubber stoppers, tubing, etc., which still possess the elasticity, are to be kept in vessels containing a dish filled with common petroleum. Keeping in wooden boxes is objectionable, while keeping in airtight glass vessels alone is sufficient to preserve india-rubber for a long time. Exposure to light should be avoided as much as possible. Old hard india-rubber may be softened again by letting the vapor of carbon bisulphide act upon it. As soon as it has become soft, it must be removed from the carbon bisulphide atmosphere and kept in the above way. Hard stoppers are easily made fit for use again in this manner, but the elastic properties of tubing cannot well be restored.

2.—In order to prevent india-rubber materials from hardening and cracking, they are steeped in a bath of melted paraffine for a few seconds, or several

### (Rubber)

minutes, in accordance with the size of the articles, and then dried in a room heated to about  $212^{\circ}$  F.

3.—Soak in the ammonia, 2 oz.; water, 6 oz.

4.—Various articles and instruments made of rubber are apt, with time, to become dry, to crack, grow brittle, and lose their elasticity. The following simple mixture is recommended: Ammonia, 1 part; water, 2 parts; in which the articles should be immersed for a length of time, varying from a few minutes to one-half or one hour, until they resume their former elasticity, smoothness and softness.

5.—Very elastic caoutchouc tubing gradually loses some of its elasticity. Later, the tubes break on stretching, even if previously laid in warm water, and finally they crack if pressed between the fingers. This change is put down to a very slow formation of sulphuric acid by the action of moist air on the sulphur contained in the caoutchouc. By frequent washing with slightly alkaline water, the action of the acid is prevented. Tubes washed five or six times a year remain perfectly elastic.

6.—*Hose, To Soften.*—a.—Dip in petroleum, expose to the air and repeat the operation if necessary.

b.—Ammonia, 2 parts; water, 4 parts. Expose for a few minutes.

c. If very hard, soften with vapor or carbon bisulphide, with the further application of vapor of kerosene.

7.—*Oil on India rubber, the Action of.*—There is a general belief that oil has an injurious effect upon rubber, and to a large extent that is pretty well proved. The power to injure, however, depends very much on the kind of oil used. According to one authority the hydrocarbons, as petroleum and rosin oils, are least injurious, while the animal and vegetable oils, represented by sperm and rape, are most destructive. There are oils in the market which profess to be without action on rubber, but this contention is said not to hold good in practice, and it is not expected such an oil will be found. Rubber has a certain life, and is consequently valuable, and it is well known that there are certain mixings in the trade which are much superior to others for oil-resisting purposes, but there is still much room for improvement, and the ideal oil-resisting rubber is not yet before the world.

8.—*Rain Coats.*—English mackintoshes often lose their elasticity when brought into our climate, soon rendering them of no service. Frequent sponging with water is recommended. If any portion of the

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### (Rubber)

cloth leaves the rubber, it should be sent to a rubber manufacturer, as it is extremely difficult to cement.

9.—*Softening Rubber*.—Use the purified gum rubber, and soften it by contact with hot water or steam, and mold by pressure. Use powdered soapstone to prevent sticking.

10.—*Stoppers, To Soften Hardened Rubber*.—Digest them for about 10 days in 5 per cent. soda lye at a temperature of about 104 to 122° F. Wash them off, scrape off the outer layer with a blunt knife, and wash in warm water.

11.—*Tubes*.—Regarding the action of coal gas on rubber tubes, it has been observed that it is weakest on ordinary gray rubber, which withstands it the longest and gives off no odor. Red rubber is more readily affected, and the black kind still more so.

To prevent rubber tubes from drying up and becoming brittle, they should be coated with a 3% aqueous solution of carbolic acid, which preserves them. If they have already turned stiff and brittle, they can be rendered soft and pliant again by being placed in ammonia which has been made with double the amount of water.

In France rubber tubes are used as a core for casting pipes from cement and sand. In order to construct a connected pipe conduit in the ground, a groove is dug and a layer of cement mortar spread out. Upon this the rubber tube is laid, which is wrapped up in canvas and inflated. The remaining portion of the channel is then filled up with cement mortar, and as soon as it has set, the air is let out of the rubber hose and the latter is pulled out and used as before. In this manner 6-inch pipes have been produced from hydraulic lime and sand at the expense of about 1 mark (24 cents) per meter.

#### Printing on Rubber, Preparation for.

Sprinkle the article with farina before vulcanization.

**Reclaiming Rubber.** (For information on this subject see the Scientific American Supplement, No. 1173.)

1.—Place the material, cut in small shreds, in a strong (boiler iron), airtight vessel, provided with a good safety valve, and introduce into it 4 or 5 parts of bisulphide of carbon for each part (by weight) of rubber. Close all the openings, and place the vessel over a suitable water bath, or, what is better, have a small steam coil inserted within the boiler. Heat for an hour at the boiling point of water.

### (Rubber)

This will insure the complete solution of the rubber. The vapor of the bisulphide is very inflammable; and when mixed with air, it is explosive when ignited. For these reasons, as well as because of the offensive odor of the solvent, the operation is best conducted in the open air, and with steam heat only.

2. For the purpose of reclaiming old vulcanized caoutchouc or other forms of rubber, first cut it up into bits, boil it with constant stirring in a properly constructed vacuum pan at a temperature of about 100° C. with five times its weight of commercial phenol until the material is completely dissolved. Provide the boiling apparatus with a reflux cooler. Thus arranged, the greater part of the phenol will be distilled off and reclaimed, and from the remaining solution the caoutchouc may be precipitated and thoroughly washed out by the addition of alcohol, soda lye, or any other convenient solvent for the residual phenol.

As far as the sulphur contained in the vulcanized rubber is concerned, part of it goes off in the shape of gaseous compounds during the boiling process, and whatever remains may be precipitated out of the solution by the addition of a small quantity of lead acetate. Should the sulphur, however, not be precipitated after this fashion directly following the distillation of the phenol, then it may be precipitated together with the rubber, whereupon the resultant mixture may be immediately revulcanized. In place of phenol, cresosote may be employed, or for that matter any other substance that possesses the properties of dissolving both the rubber and the sulphur.

3.—The following is an outline of a process described in English letters patent: The caoutchouc, cut into shreds, is first heated in vacuo to 100° C. (212° F.) along with 5 times its own weight of commercial (crude) phenic acid. By this boiling the sulphur is partially transformed into volatile products, and thus eliminated partially along with the products of distillation of phenol, and partially by precipitation by lead acetate. The caoutchouc is then precipitated by the addition of some solvent of phenol, such, for instance, as alcohol, sodium hydrate, etc., and is now in a condition for immediate revulcanization.

#### Repairing.

1.—*Hose*.—Fill the cracks previously cleaned with the following solution: 20 parts of gutta percha, 40 parts of caoutchouc, 10 parts of isinglass, 100 parts of

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### (Rubber)

sulphide of carbon. Very wide, gaping slits may be plastered with the solution in layers and the slit drawn together with a string. Allow 1 to 2 days for drying. Then the string can be cut through and the protruding cement trimmed off with a sharp knife, that has previously been dipped in water.

2.—*Pads and Covers*.—a.—Before the patching, the cracked surfaces to unite well must be dried, entirely freed from all dirt and dust and greased well, otherwise the surfaces will not combine.

b. In case of a cover, waterproof coat, or rubber boots, etc., take a moderately thick piece of india-rubber, suited to size of the object, cut off the edges obliquely with a sharp knife moistened in water, coat the defective places as well as the cut pieces of rubber with oil of turpentine, lay the coated parts together and subject them for 24 hours to a moderate pressure. The mended portion will be just as waterproof as the whole one.

c.—Rubber cushions or articles containing air are repaired in a very simple manner, after being cleaned as aforesaid. Then take colophony, dissolve it in alcohol (90%) so that a thick paste forms, smear up the holes, allow all to harden well, and the rubber article, pillow, ball, knee caps, etc., may be used again.

### Softening Rubber. (See Preserving Rubber.)

#### Solvents.

1.—The best solvent and perhaps the most rapid consists of a mixture of methylated ether and petroleum spirit—the common benzoline used for burning in sponge lamps. The mixture is as much superior in power to either of its constituents singly as the ether-alcohol is to plain ether in its action on pyroxyline.

2. A very thick solution can be made by dissolving 60 gr. of good india-rubber in 2 oz. of benzoline and 1 oz. of sulphuric ether. If the india-rubber be cut up fine and the mixture shaken occasionally, the solution will be complete in two or three hours, when it may be diluted to any required strength with benzoline alone. The india-rubber should be as light colored as possible, and all the outer oxidized portions must be cut away. Shred the clean india-rubber with a pair of scissors, and throw it at once into the solvent.

#### Sponge Rubber.

The uses to which sponge rubber are put are many and varied. It is used as a cushion for rubber stamps, in artificial

### (Rubber Stamps)

feet, in playing balls, in semi-solid tires, for erasing rubber, for glove-cleaners, and it has been tried in horse collars, harness pads, cushions, and so on. In all cases the sponginess is induced by incorporating something that will give off vapors during the process of cure. The very cheapest liquid for this purpose is water; hence one of the first compounds for puff balls depended upon its dampness for sponging. It was as follows:

1.—Soft African rubber, 5 lb.; reclaimed rubber, 5 lb.; whiting, 6 lb.; litharge, 2 lb.; palm oil, 1 lb.; sulphur, 5½ oz.; damp sawdust, 2 lb. The sawdust was just fine enough to pass through a sieve of No. 20 mesh. It was thoroughly wet and the mixing done on a cool mill. A slow cure and the cooling of the moulds before opening are of course necessary.

2.—Compounds similar to the above where fiber, substitute, etc., are made the means of carrying the water are very common and are exactly as good for the purpose. Quite a variety of ingredients are used in some of the spongy compounds, but none will appear to the rubber manufacturer to be more novel than brown sugar and licorice, both of which bring about sponginess. Perhaps the most distinctively "freak" compounds in this line are those that follow, and have been the subjects of British patents:

a.—Para rubber, 50 lb.; tungstate of soda, 9 lb.; alum, 2 lb.; carbonate of ammonia, 14 lb.; asbestos (fine powder) 23 lb.; arsenic, 1 lb.; gum kauri, 1 lb.

b.—Carbon of ammonia, 15½ lb.; alum, 3 lb.; tungstate of soda, 3 lb.; borax, 5 lb.; camphor, 10½ lb.; lampblack, 10½ lb.; Para rubber, 50 lb.; sulphur, 2½ lb.

c.—Alum, 6 lb.; tungstate of soda, 6 lb.; chloride of ammonium, 12 lb.; borax, 8¾ lb.; camphor, 6 lb.; lampblack, 8¾ lb.; Para rubber, 50 lb.; sulphur, 2½ lb.

It is an easy matter to cause rubber to "sponge." But to make a perfect rubber sponge, is quite a different problem. This is because the trade demands a rubber sponge that is odorless, that is evenly spongy, and one that will not harden after lying in stock for a month or two. Hence only factories in which experiments are continually made can produce a satisfactory article.

#### Stamps, Rubber.

The process of making rubber stamps being very simple, and the materials and apparatus for carrying out the process being inexpensive, doubtless many would undertake this branch of business if the

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details of manufacture were well known. The secrets of rubber stamp making have always been carefully guarded, thus practically limiting the business to those who have learned the trade in the regular way. The instructions given below are based upon the actual practice of the best makers, and written after actual experience in the business.

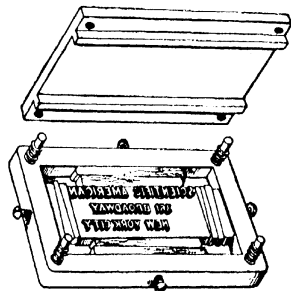
The tools required for beginning the business are one or more fonts of regular printers' type, one or two chases, some printers' leads, and a small press. The chases are expensive, and as the type is only subjected to a moderate pressure, a cast-iron chase may be used instead of one made of wrought iron, and even a wooden chase may be made to answer, but this is not recommended. If a wooden chase is resorted to, it should be made from hardwood, such as oak or cherry, of one and one-half inch bars dovetailed together. If ordinary type is used, the chase may be one-half to five-eighths of an inch high. In one side and one end should be inserted two or more screws for clamping the type in the chase. Some printers' wooden furniture will be needed for filling in the chase around the type; leads also are used for the purpose and for spacing between the lines. In each corner of the chase a short three-eighths inch iron rod is inserted. These rods form a guide for the matrix plate, which is perforated to receive them, and between the matrix plate and the rods are placed short spiral springs, as shown in the engraving. These springs are designed to prevent the composition, of which the mold is formed, from coming into contact with the type before the screw of the press is applied. The iron matrix plate is of the same size as the chase, and is provided with two longitudinal ribs. The under surface of the plate, including the ribs, should be planed. The rods which form the guides for the matrix plate must project from the chase at right angles, and must be well fitted to the holes in the plate. The ribs of the matrix plate are one-eighth of an inch high.

Type-setting is somewhat difficult for an amateur, but a little practice will soon give proficiency. The type, when set, reads backward, so that if it is desirable to see how the type will appear, a piece of print may be held to the light and viewed from the back side. When the form is made up it is placed in the chase and centered by means of the wooden furniture and leads, the leads being placed next to and between the rows of type. The form should be made up on a flat surface, such as a slab of marble or a level

### (Rubber Stamps)

hardwood plank. As soon as the form is locked by means of the screws, the type is planed by laying over it two or three thicknesses of paper, placing on these a smooth, flat block, and tapping the block with a mallet. As soon as the surface of the type is leveled, the screws in the chase are again tightened, and the form is ready to receive the impression.

The type is now ready to receive the composition of which the mold is formed. The following is considered the best and most reliable formula for this composition: Finely powdered soapstone, 1 lb. 3 oz.; best dental plaster, 1 lb.; fine powdered China clay (kaolin), 1 lb. These materials are mixed dry, and sifted



through a sieve having a fine mesh. A quantity of the composition sufficient to form the mold is placed in a suitable vessel, and mixed with a solution formed by dissolving 5 oz. of dextrine in 1 qt. of hot water. This is to be used cold, and can be prepared in advance. Enough of the dextrine solution is added to the composition to make a thick dough a little stiffer than putty. It should be thoroughly but very quickly mixed and kneaded, and should be smooth and free from lumps. It is to be spread out upon the matrix plate so as to nearly cover the entire space between the longitudinal ribs; then by means of a brass-edged ruler, a straight iron bar, or even a table knife, the top of the composition is smoothed and made level, employing the longitudinal ribs of the matrix plate as guides.

When the composition is level with the longitudinal ribs and perfectly smooth, the type is well moistened with benzine, and the matrix plate bearing the coating of composition is placed over the top of

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the form, the rods before alluded to forming the guides for the plate, and the plate is allowed to rest upon the springs. Then the form, together with the matrix, supported above the type in the manner described, is put in the press, and sufficient pressure is applied to carry the matrix plate down so as to cause the composition to take a perfect impression of the type. The pressure is relieved, and the matrix plate is then removed and allowed to stand for about three minutes, when it is again put on the form above the type, in the manner before described, and then placed a second time in the press and again subjected to pressure, this time using a little more force. The distance to which the type penetrates the composition can be regulated by the printers' leads.

The press used may be purchased from one of the rubber stamp supply houses, or an ordinary letter press may be brought into use, but it is absolutely essential that the plates of the press be parallel. Presses which will answer every purpose can be frequently picked up at the junk shops for a mere trifle. Many substitutes for a press will suggest themselves, but in this, as in anything else, whatever is worth doing is worth doing well; therefore it is advantageous to procure the best tools and appliances on the start.

In any event the press must be capable of standing a heat of 250° F. without warping.

When the matrix is removed from the type the mold should be glossy in every part, and each letter should be clear-cut and sharp. Small perforations are now made in the matrix, care being taken to not make them too near the impressions of the type. These are for vents for the escape of moisture. The plate is now heated in an oven for about an hour and a half. The mold is sometimes apt to crack, but this is generally due to too much heat or to a lack of homogeneity in the composition. When the mold is thoroughly dry its face is smoothed with fine sandpaper, and the dust is blown from the letters by means of a bellows.

The rubber used in making stamps is especially prepared by manufacturers for this purpose. It is pure unvulcanized rubber prepared in a special way for vulcanization. Much of the trouble of amateurs in making rubber stamps arises from the use of vulcanized rubber, or of a wrong composition or thickness. The material should be obtained from reliable dealers in rubber stamp materials or from the rubber manufacturers who make a specialty of it. It is purchased in sheets which are

### (Rubber Varnish)

readily cut to the required size; they should be a little larger than the impression of the type.

To prevent the adhesion of the rubber to the mold, before the rubber is applied it is thoroughly covered with powdered soapstone, the surplus being rubbed off. The press is heated to about 220° F., the temperature being regulated usually by a thermometer attached to the press, but this may be dispensed with by exercising due care in the process of vulcanization. A pair of Bunsen burners afford a ready means of securing an even and well regulated temperature.

It is well to make a few small stamps first, to see that everything is working right. The rubber is pressed on the matrix; a piece of sheet tin is placed over the rubber; the mold, with the applied rubber, is placed in the warm press, and pressure is gradually applied, thus forcing the rubber into every part of the impression. The time required for vulcanization with a warm press is from three to five minutes; sometimes the time is extended to ten minutes if the press is not sufficiently warm. If the press is overheated, the rubber will be burnt. This is mainly a matter of experience, and can be learned only by actual practice. When the rubber is nearly vulcanized, it has a bluish shade, and if it is pricked with a needle or awl, if the rubber is vulcanized no mark will be left on the removal of the needle; but if it is only semi-vulcanized, the needle will leave a perforation. By occasionally pricking the rubber, the time of exposure to the heat may be roughly determined. A second impression from the mold requires about double the time. When the rubber is vulcanized it is removed from the matrix by an even pull, and a sheet of stamps thus formed is immediately rubbed with powdered soapstone applied by means of a brush. The different stamps are then cut apart with scissors and mounted on a handle by means of shellac varnish.

For a good ink for rubber stamps see the chapter on WRITING MATERIAL.

**Substitutes for Rubber.** (See Artificial Rubber.)

**Varnishes for Rubber.**

*India-rubber Varnish.*—1.—An excellent and rapidly drying waterproof varnish is prepared in the following manner: Heat a weighed quantity of boiled linseed oil until it fumes strongly. A vessel with plenty of extra room in it must be used. Have ready some india-rubber cut small, and 1 oz. of it for every pound in the orig-

## *Rubber, Gutta Percha and Celluloid*

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### (Rubber Varnish)

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inal weight of the oil. When one piece thrown in melts at once, put in the rest gradually, and when all is melted stop the heating. When cold dilute the varnish with turps to the required consistency.

2.—Dissolve 10 lb. of india-rubber in 10 lb. of turpentine and 20 lb. of petroleum by treating same on a water bath. When the solution is completed add 45 lb. of drying oil and 5 lb. of lampblack and mix thoroughly.

3.—Dissolve 7 lb. of india-rubber in 25 lb. of oil of turpentine. By continued heating dissolve 14 lb. of rosin in the mixture. Color while hot with 3 lb. of lampblack.

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### (Rubber Varnish)

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4.—Fuse together 10 lb. of rosin and 6 lb. of oil of turpentine. Then add 5 lb. of india-rubber and 11 lb. of linseed oil and heat and stir to complete mixture. Then add 3 lb. of lampblack.

5.—Dissolve india-rubber in 7 times its weight of benzol by keeping them together in a warm place in a stoppered bottle and frequent shaking. This varnish serves also as a cement for india-rubber.

6.—Heat together 100 lb. of raw linseed oil, 10 lb. of india-rubber, 10 lb. of boiled oil and 8 lb. of Prussian blue.

**Vulcanite.** (See EBONITE and VULCANITE.)



## CHAPTER XXIII

### SOAPS AND CANDLES

#### CANDLES

**Adamantine.**—Mutton tallow, 100 lb.; camphor, 2½ lb.; beeswax, 4 lb.; alum, 2 lb.

**Cable or Twisted Candles.**—These are molded in the ordinary way, and then turned by means of a special lathe; or they may be cast in rifled molds, from which, on cooling, they are wound out.

**Cerophane.**—Melt over a water bath 50 parts of stearic acid and 5 to 5½ parts of bleached beeswax. Let it remain over the water bath for ½ hour, but do not stir or agitate. Then allow the fluid to cool, until there is a slight film on the surface. Pour the mass into molds, which have been heated to the same temperature, but avoid stirring.

**Colored.**—Among the coloring matters used for candles are the following:

1.—Blue.—Prussian blue, indigo, ultramarine, copper sulphate, aniline blue.

2.—Red.—Carmine, Brazil wood, alkanet root, minium, vermillion aniline reds.

3.—Yellow.—Gamboge, chrome yellow, naphthaline yellow.

4.—Green.—Mixture of blue and yellow colors.

5.—Purple or Violet.—Mixture of blue and red colors.

6.—Neutral Tints.—Oxides of iron, yellow ochre, Frankfort black.

7.—Black.—a.—Fruit of *Anacardium occidentale*, aniline blacks. In order to dye paraffine candles with an aniline base, such as magenta, the dye is first dissolved in stearine, and a little of the resulting stearate is added to the paraffine.

b.—Anacardium Method.—Paraffine, or whatever material is desired for the candles, is heated from 200 to 210° C. with 25% of its weight of the chopped fruit of *Anacardium occidentale*. Candles prepared in this way are equally black throughout, and yield no irritating vapors when burnt.

c.—Aniline Method.—The material to be dyed is heated a few degrees above its melting point with 1 to 2% of nigrosine

fat color. Paraffine and spermaceti require 1%; stearine and wax require from 1½ to 2%. The candles thus prepared are said to be of a somber hue throughout, and of a jet black appearance.

8.—Ceresine Candles for the Christmas Tree.—For coloring these candles, only dyestuffs soluble in oil can be employed.

a.—Blue.—23-24 lavender blue, pale or dark, 100-120 grams per 50 kgm. of ceresine.

b.—Violet.—26 fast violet R, 150 grams per 50 kgm. of ceresine.

c.—Silver Gray.—20 silver gray, 150 grams per 50 kgm. of ceresine.

d.—Yellow and Orange.—30 wax yellow, medium, 200 grams per 50 kgm. of ceresine; 61 old gold, 200 grams per 50 kgm. of ceresine.

e.—Pink and Red.—27 peach pink or 29 chamolis, about 100 grams per 50 kgm. of ceresine.

f.—Green.—16-17 brilliant green, 33 May green, 41 May green, 200-250 grams per 50 kgm. of ceresine. The above named colors should be ground in oil and the ceresine tinted with them afterward.

**Diaphne.**—Melt together, in a steam jacket, 5 lb. of vegetable wax, 3 lb. of pressed mutton tallow and 11 lb. of stearic acid. The stearic acid and the vegetable wax are the hardening ingredients.

**Glycerine.**—Professor Laroche makes a new kind of candle by dissolving 5 parts of colorless gelatine in 20 parts of water, adding 25 parts of glycerine, and heating until a perfectly clear solution has been formed. To this is added 2 parts of tannin dissolved by heating in 10 parts of glycerine. A turbidity is produced which should vanish on further boiling. The boiling is continued until the water has been driven off. The candles obtained in this way are as clear as water, and burn quietly, and without spreading any odor.

**Home-made Candles.**—Many of our readers in the rural districts will find that candles can be made economically by mixing a little melted beeswax with the tallow to give durability to the candle

Always consult the Index when using this book.



## Soaps and Candles

### (Candles)

and to prevent its running. The light from a tallow candle can be improved in clearness and brilliancy by using small wicks which have been dipped in spirits of turpentine, and thoroughly dried.

**Lard.**—1.—Dissolve 1 lb. of alum and 1 lb. of saltpeter in 2 qt. of water, over a slow fire; 12 lb. of lard are added. The stirring must be kept up continually until all the lard is dissolved. Do not leave on the fire too long, as the lard is liable to be discolored. It is said that these candles are superior to tallow.

2.—Solid Candles from Lard.—Cut 16 lb. of lard in small pieces, put in a pot with  $\frac{1}{2}$  lb. of alum and  $\frac{1}{2}$  lb. of saltpeter (previously dissolved in 1 pt. of water over a slow fire). Stir constantly over a slow fire until all the lard is dissolved. Allow to simmer until the steam ceases to rise, then remove from the fire. These candles are harder than those made from tallow.

**Mutton Suet Candles in Imitation of Wax.**—Throw quicklime in melted mutton suet; the lime will fall to the bottom, and carry along with it all the dirt of the suet, so as to leave it as pure and fine as the wax itself. Now, if to 1 part of the suet you mix 3 parts of real wax, you will have a very fine, and, to all appearances, a real wax candle; at least, the mixture could never be discovered, nor even in the molding of wax ornaments.

**Scented or Aromatic.**—These are prepared by introducing a very small quantity of any appropriate aromatic into the material (fat, wax, or wick) of which they are made, while it is in the liquid state. Camphor, gum benzoin, balsam of Peru, cascarilla, essential oils, etc., are generally the substances selected. Care must be taken not to overdo it, as then the candles will burn smoky, and give little light.

**Spermaceti.**—Spermaceti, either alone, or combined with hard white tallow, forms very good candles, but they will not bear carrying about in the hand without spilling the melted portion.

**Stearine.**—These are made of the stearine of stearic acid, obtained from tallow, in the same way as other molded candles. They furnish a superior light, and burn a long time. Several years ago it was a general practice for the manufacturer to add a little arsenious acid (white arsenic) to the stearine, to prevent it crystallizing, and thus spoiling the appearance of the candle; but owing to the spirited way in which this rascality was exposed by

### (Candles)

the press, it has been discontinued by all the respectable houses.

**Tallow.**—1.—To make hard tallow candles, use a mixture of mutton tallow, 10 oz.; camphor,  $\frac{1}{2}$  oz.; beeswax, 4 oz.; alum, 2 oz.

2.—Coating with a Hard Substance which Will Not Crack.—Dip the candles successively into the following three mixtures:

a.—White rosin, 4 parts; good tallow, 88 parts; camphor, 6 parts; stearic acid, 20 parts; dammar rosin, 2 parts. Melt.

b.—Tallow, 48 parts; camphor, 6 parts; stearic acid, 20 parts; white pitch, 4 parts; dammar rosin, 10 parts. Melt together.

c.—Stearic acid, 20 parts; white wax, 4 parts; tallow, 10 parts; camphor, 6 parts. Melt.

3.—Hardening.—Dip first in the following: Stearic acid, 50 parts; tallow, 44 parts; camphor, 3 parts; white rosin, 2 parts; gum dammar, 1 part. When hard, dip in other solution, which consists of stearic acid, 70 parts; tallow, 24 parts; camphor, 3 parts; white wax, 2 parts; gum dammar, 1 part. For a final coating, dip in stearic acid, 90 parts; tallow, 5 parts; camphor, 3 parts; white wax, 2 parts.

**Trickling of Burning Candles, To Prevent.**—For the purpose of obviating this evil it is recommended to dip the candles into the following mixture: Magnesium sulphate, 15 parts; dextrine, 15 parts; water, 100 parts. The solution dries quickly, and does not affect the burning of the candle.

**Wax Candles.**—1.—These are made either by pouring melted wax over the wick or by applying the wax in a soft state, with the hands, and afterward rolling it smooth with a roller of polished boxwood, upon a table formed of polished walnut wood. They are then cut and trimmed. The first part of this process is usually conducted over cisterns of melted wax, and the wicks are strung upon an iron hoop suspended from the ceiling.

2.—Imitation Wax Candles.—To tallow, purified by throwing powdered quicklime in it when melted, add 1 part of wax to 1-3 part tallow. This makes a beautiful candle, resembling wax. Put 1 oz. of saltpeter and  $\frac{1}{4}$  lb. of lime in 2 qt. of water. Dip the wicks in this. This prevents the tallow from running, and also improves the light.

**Wicks.**—1.—Preparing.—To improve the light, and prevent the tallow from running, use the following preparation:

a.—Steep the wicks in a solution of

## Soaps and Candles

### (Soaps)

lime water to which saltpeter has been added in the proportion of  $1\frac{1}{2}$  gal. of water, 3 oz. of saltpeter and  $\frac{1}{4}$  lb. of lime. Dry the wicks before using.

b.—Borax, 3 oz.; calcium chloride, saltpeter, chloride ammonium, each  $1\frac{1}{2}$  oz.; dissolve in  $4\frac{1}{2}$  qt. of water, and filter. Soak the wicks in this solution, then dry.

c.—Soak the wick in one of the following: Boracic acid, 2 lb.; water, 10 gal.

d.—Boracic acid, 8 lb.; sulphuric acid, 5 lb.; water, 100 gal. In these baths the wicks are soaked for a few hours in the cold.

e.—Ammonium chloride, 2 lb.; sodium nitrate, 2 lb.; water, 200 gal. The wicks are soaked in this solution for from 10 to 15 minutes, at the boil, and then dried at 40 to 50° C.

f.—Phosphoric acid, 2 lb.; water, 400 gal. The wicks are soaked in a hot solution for about 10 minutes. Some makers use two baths. The first bath consists of sulphuric acid mixed with 100 times its weight of water. After 24 hours in this, the wicks are dried at a low temperature and put into a bath consisting of 25 lb. of boracic acid, 18 lb. of sulphate of ammonia, and 100 gal. of water. The wicks are then dried in a warm room.

2.—Snuffless Wicks.—The great objection to tallow candles is the frequent necessity for removing the snuff, or charred wick, which rises into the body of the flame and obscures the light. If the wick can be exposed to the air it will be entirely consumed.

a.—This is done in composite candles by plaiting the cotton into a flat wick, which, as it burns, curves over. Sometimes a very fine wire is included in the wick, which is usually dipped in a solution of borax.

b.—Twist the wick with one strand shorter than the others, which will bend the wick slightly when the fat melts.

The manufacture of candles is treated of in our Scientific American Supplement, Nos. 947, 1274, 1287 and 1389.

### SOAPS

1.—Powdered Castile soap, 7 oz.; powdered borax, 2 oz.; pumice stone, fine powder,  $1\frac{1}{2}$  oz.; tripoli, 1 oz.; Spanish whiting, 9 oz.; solution of carmine, q. s. to color; oil of sassafras, q. s.  $\frac{1}{2}$  dr.; water, q. s. to make a thick paste. Mix, and keep in airtight retainers.

2.—Fluid extract of quillaja, 2 oz.; borax, 1 oz.; fuller's earth, 1 oz.; soft soap, 12 oz.; water, enough. Rub the borax with the fluid extract, and add the fuller's earth. When these have been

### (Ammonia Soaps)

thoroughly mixed, incorporate with the soft soap, adding a little water, if necessary, and perfume, if desired.

*Alabaster Soap, White.*—Stearine,  $\frac{3}{4}$  lb.; coconut oil, 11 lb.; glycerine,  $\frac{3}{4}$  lb.; lye of 38° B., 9 lb.; alcohol of 96%, 13 lb. The stearine and coconut oil should be saponified by heating with the lye to 178° F., then the alcohol should be added. When these combine, add the glycerine. After the soap becomes clear let it cool to 133° F., when it may be put in the frames. Perfume with 2 oz. of oil of bergamot,  $\frac{1}{2}$  oz. of oil of geranium, 7 dr. of oil of neroli and  $\frac{1}{2}$  oz. of oil of lemon.

*Almond Soap.*—1.—Oil of almonds, by weight, 21 oz.; solution of caustic soda (sp. gr. 1.334), by weight, 10 oz. Add the lye to the oil in small portions, stirring frequently. Leave the mixture for some days at a temperature of from 64 to 68° F., stirring occasionally, and when it has acquired the consistency of soft paste put it into molds till sufficiently solidified. It should be exposed to the air for 1 or 2 months before using.

2.—Bitter Almond Soap.—a.—Pure white soap, 10 kgm.; oil of bitter almonds, 120 grams. Not colored.

b.—White tallow soap, 56 lb.; oil of almonds,  $\frac{1}{4}$  lb. For inferior kinds, nitrobenzol is employed instead of oil of almonds.

c.—Best white tallow soap,  $\frac{1}{2}$  cwt.; essence of bitter almonds, 10 oz.; as soap a la rose. Very fine.

d.—White curd soap, 100 lb.; oil of bitter almonds, 20 oz.

*Ammonia.*—1.—Ammonia soap (or ammoniacal soap) is prepared by adding to hot oleic acid, stronger ammonia water until the odor of ammonia remains perceptible and the mass assumes a translucent, jellylike appearance.

2.—Capsicum, 4 oz.; mustard seed, 1 oz.; diluted alcohol, enough to make 8 oz.; olive oil, 19 oz.; ammonia water, 1 oz.; distilled water, 4 oz. Macerate the capsicum and the mustard seed in 8 oz. of diluted alcohol for 10 days; filter, and add sufficient diluted alcohol to bring the volume of the filtrate up to 8 oz. Mix this with the other ingredients, and shake well.

3.—A soap is first formed in the usual way from the following ingredients: Stearic acid, 8 parts; coconut oil, 4 parts; potash and soda, of each 1 part; water, 6 parts. The soap, when cold, is cut into shavings, which are then placed in a retort, in which they are subjected to the action of gaseous ammonia at 2

## Soaps and Candles

### (Borax Soap)

pressure of 15 lb. per square inch, until the soap has become thoroughly impregnated with it.

4.—Parts by weight: Oil of sweet almonds, 8; ammonia, 1.

5.—Parts by weight: Grease soap, 30; alcohol, 250; ammonia, 8. The soap, scraped into shreds, is dissolved in the alcohol, and the ammonia is added.

*Attar of Rose.*—(See *Otto of Rose*.)

*Beef Marrow Soap.*—To 500 lb. of beef marrow add 250 lb. of caustic soda lye of 36° B., stir constantly and gently, and heat the mass till it becomes soluble in water. In this state dilute with 2,000 parts of boiling water, and pour in 1,000 parts of brine (containing 180 parts of common salt), with constant stirring. After allowing some time for repose, pour into the frames, and leave for a day or two to set thoroughly.

*Benzoin Soap.*—1.—Saponify 32 kgm. of prime Cochin cocoanut oil with 16 kgm. of soda lye of 40° B., in the ordinary way. Perfume with 2 kgm. of tincture of benzoin (1 part of benzoin to 3 parts of rectified spirits). Add, and distribute well, 300 c.c. of secunda earth.

2.—White curd soap, 40 lb.; tincture of benzoin, 54 oz. The soap must be in the form of a very stiff paste, otherwise the tincture of benzoin will render it rather soft. Brown ochre may be used as the coloring agent.

*Bergamot Soap.*—Cocoanut oil, 4 lb.; lard, 1 lb.; soda lye, of 40°, 2½ lb. Perfume with bergamot oil, 1 oz.; oil of geranium, 2½ dr.

*Black Soap, or Farrier's Soap.*—This is a coarse kind of soft soap, made from fish oils and caustic potash; sometimes tar is added. Besides the substances above named, iodine, bromide, creosote, and many other chemical substances, have been employed for making what are sometimes termed skin soaps, but they are all prepared in much the same way as above indicated. This is properly a crude soft soap made of fresh oil, tallow and potash; but the following mixture is usually sold for it: Soft soap, 7 lb.; train oil, 1 lb.; water, 1 gal.; boil to a proper consistency, adding ivory black or powdered charcoal to color.

### (Bubble Liquids)

*Bouquet.*—*Savon au Bouquet.*—1.—This soap is prepared from the following: White curd soap, 60 lb.; olive-oil soap, 40 lb.; perfume with oil of bergamot, 13 oz.; oil of neroli, 1½ oz.; oil of cloves, sassafras and thyme, each 1¼ oz. Color with brown ochre, 22 lb.

2.—Best tallow soap, 30 lb.; essence of bergamot, 4 oz.; oils of cloves, sassafras and thyme, of each 1 oz.; pure neroli, ½ oz.; finely powdered brown ochre, 7 oz. Mix as last. Very fine.

3.—White tallow or lard soap, 10 kgm. Perfume with oil of bergamot, 15 grams; neroli, 15 grams; sassafras, 10 grams; thyme, 10 grams. Color with brown ochre, 100 grams. The oil of neroli may be replaced by oil of lavender, and oil of cloves, 10 grams, may also be added.

*Bran Soap.*—Add to good soap from 2 to 4% of bran.

*Bubble Liquid.*—1.—White hard soap, 25 parts; glycerine, 15 parts; water, 1,000 parts.

2.—Dry Castile soap, 1 part; glycerine, 15 parts; water, 20 parts.

3.—Palm soap, 1 part; glycerine, 8 parts; water, 8 parts.

4.—Procure a quart bottle of clear glass and some of the best white Castile soap (or, better still, pure palm-oil soap). Cut the soap (about 4 oz.) into thin shavings, and having put them into the bottle, fill it up with distilled or rain water, and shake it well together. Repeat the shaking until you get a saturated solution of soap. If, on standing, the solution settles perfectly clear, you are prepared for the next step: if not, pour off the liquid and add more water to the same shavings, and shake as before. The second trial will hardly fail to give you a clear solution. Then add to 2 volumes of soap solution 1 volume of pure concentrated glycerine. Grand soap bubbles can be blown with this preparation.

5.—Take olive-oil soap (genuine white Castile), cut it into thin shavings, and dry thoroughly. Dissolve these shavings in alcohol until the alcohol is saturated. The solution should show a sp. gr. of 0.88.

## Soaps and Candles

### (Castor-Oil Soap)

Mix glycerine with water until it shows a density of 17.1° B. To 6.102 cu. in. of solution 3 add 1.52 cu. in. of solution 2, and boil until the alcohol is all expelled—until the temperature rises above 212°. Cool, and turn into a graduated flask, and add water to make the volume 6.102 cu. in. Filter, if necessary, to remove oleate of lime.

**Camphor Soap.**—1.—Stir together 50 kgm. of prime cocoanut oil and 25 kgm. of soda lye of from 38 to 40° B., at 43 to 44° C. (110 to 114° F.). Add 1.5 kgm. of camphor, dissolved in alcohol or oil, 500 grams of kummel oil, and 500 grams of oil of rosemary. Stir well in.

2.—Tallow curd soap, 50 lb.; oil of rosemary, 2½ lb.; camphor, 2½ lb. Powder the camphor by triturating it with some almond oil, and sift. When the soap is ready to put in the frame add the camphor and rosemary oil.

3.—Spermaceti, 4 oz.; melt it by a gentle heat; add camphor, cut small, 2 oz.; and when dissolved, add the mixture to white curd soap, 6½ lb.

\* **Carbolic-Acid Soap.**—Half palm soap, 20 lb.; starch, 1 lb.; carbolic acid in crystals, 1 oz.; oil of lavender, 2 oz.; oil of cloves, 1 oz. The carbolic acid is added to the soap in a melted state, and thoroughly incorporated.

**Carpet Soap.**—Fuller's earth, 4 oz.; spirits of turpentine, 1 oz.; pearlash, 8 oz. Rub smooth, and make into a stiff paste with a sufficiency of soft soap.

**Castile, White.**—1.—Olive oil, 40 parts; ground suet, 30 parts; tallow, 30 parts.

2.—Olive oil, 30 parts; lard, 30 parts; palm-nut oil, 40 parts.

3.—Olive oil, 30 parts; cotton-seed oil, 30 parts; tallow oil, 40 parts.

4.—Palm oil (bleached), 50 parts; sesame oil, 20 parts; tallow, 30 parts.

**Castor-Oil Soap.**—This soap, prepared as below, is said by Mr. Hammer to answer best for preparing soap liniment (linimentum saponis co.): Saponify 2 pt. of castor oil with 6 oz. of caustic potash and 2 pt. of water, by heating until a transparent mixture is obtained; then add a saturated solution of 8 oz. of chloride of sodium, stir until cool, allow to subside for a day, decant the liquid portion, cut in pieces, and dry for use.

**Celluloid, Polished Horn, etc., Soap for.**—Boil together 20 parts of cocoanut oil and 10 parts of soda lye, of 40° B., until the oil is thoroughly saponified. Remove from the fire, let cool down somewhat, and add 15 parts of finely pow-

### (Cold-Water Soap)

dered and levigated rotten stone, and stir in thoroughly. If it is desired to perfume the soap, add sufficient oil of lavender, or, better, of a mixture of 6 parts of oil of lavender, 6 parts of oil of thyme, and 4 parts of oil of rosemary. For the finer class of goods, jewelers' rouge should be substituted for rotten stone, unless the latter be ground excessively fine.

**Chemical.**—Powdered fuller's earth, ½ oz.; just moisten with spirits of turpentine, and add salts of tartar, ½ oz.; best potash, ½ oz.; work the whole into a paste with a little soap. It is excellent for removing grease spots.

**Chlorinated Soap.**—Powdered Castile soap, 11 oz., and dry chloride of lime, 1 oz., are beaten into a mass with sufficient rectified spirit, holding in solution oil of verbena, or ginger grass, ¼ oz. The mass is then formed into flat tablets, and wrapped in thin sheets of gutta percha.

**Cinnamon Soap.**—White curd soap, 60 lb.; palm-oil soap, 40 lb. Color with 2 lb. of yellow ochre and perfume with oil of cinnamon, 14 oz.; oil of sassafras, 2½ oz.; oil of bergamot, 2½ oz.

**Citron Soap.**—Curd soap, 6 lb.; otto citron zester, ¾ lb.; otto of verbena (lemon grass), ½ oz.; otto of bergamot, 4 oz.; otto of lemon, 2 oz.

**Cocoanut Oil Soap.**—Put 50 lb. of cocoanut oil and 50 lb. of caustic soda lye, of 27° B., into a soap kettle; boil and mix thoroughly for 1 to 2 hours, until the paste gradually thickens; then diminish the heat, but continue stirring until the cooling paste assumes a white, half-solid mass; then transfer quickly to the frames. A mixture of equal parts of cocoanut oil and tallow will make a very fine filled soap. Cocoanut oil, mixed with almost any fats, if they are not in too large proportions, will produce filled soaps.

**Cod Liver Oil Soap.**—Cod liver oil, 2 oz.; caustic soda, 2 dr.; water, 5 dr.; dissolve the soda in the water and mix it with the oil.

**Cold Cream Soap.**—Spermaceti soap, 25 lb.; white soap, 37½ lb.; caustic potash, 6°, 1¼ lb.; gum tragacanth, 2½ oz.; oil of almonds, ¾ lb. Shred the soap, put in the hopper of the mill, dissolve the gum in a little water, and mix with the lye and oil. Add this to the soap, and grind. Perfume with oil of bitter almonds, 1¼ oz.; oil of cloves, 1¼ oz.; oil of bergamot, 6¼ oz.

**Cold-Water Soap.**—Cocoanut oil, 35 parts; rosin, 32 parts; soda lye, 36° B., 33 parts. Oil and rosin are heated to about 122° F. and the lye quickly stirred

## Soaps and Candles

### (Dry-Cleaning Soap)

in. In making up large quantities, higher temperatures are advantageous. The considerable proportion of free alkali is added purposely to increase the detergent or washing power.

**Colored Fabrics.**—Fabrics dyed with sensitive colors are injured when washed with the laundry soaps ordinarily found on the market. A good cleansing material for such fabrics is furnished by a mixture consisting of 10 parts of extract of soap bark, 10 parts of borax, 30 parts of oxgall and 50 parts of Marseilles soap. In some cases, a more efficient soap is obtained by mixing 30 parts of stronger ammonia water, 40 parts of olein and 500 parts of water. Before either of these remedies is applied a preliminary trial should be made with a lukewarm solution of a soap absolutely free from alkali.

**Copper and Iron Soaps.**—These are used to give plaster articles the appearance of antique green bronze or Florentine bronze, and are made by decomposing an alkaline soap with a solution of sulphate of copper or of sulphate of iron. They are soluble in fatty oils, and especially so in turpentine.

**Cream Soap.**—Take white, soft, lard potash soap, recent, but moderately firm, and beat in small portions at a time, in a marble mortar, until it forms a white homogeneous mass; add sufficient essential oil of almonds, supported with a little oil of bergamot, or of cassia, put in during the pounding.

**Croton Soap.**—From croton oil and liquor of potassa, equal parts; triturated together in a warm mortar until they combine.

**Deodorizing Fat for Making Perfumed Soap.**—Boil 80 lb. of fat with 28 lb. of water containing 5 oz. of common salt, and  $2\frac{1}{4}$  oz. of powdered alum. Boil for 10 minutes. Strain off the water, and let the fat remain several hours before using.

**Disinfecting Soap (Jey's Improved).**—Gas tar is distilled and the light oil rejected; 16 parts of the heavier oil, 32 parts of cocoanut oil and 16 parts of caustic soda at 35° B., are saponified in a jacketed pan, with or without the addition of rosin and sodium sulphate and carbonate. (See also *Naphtha Soap*.)

**Dry-cleaning Soap.**—Soaps soluble in benzine are employed for the dual purpose of assisting the cleaning process and to minimize the risk of fire. The following quantities give satisfactory results, parts by weight: Oleic acid, 5; caustic potash, 1; dissolved in methylated spirit, 4. These quantities are arranged to produce a slightly superfatted soap

### (Extract of Soap)

freely soluble in benzine. By increasing the quantity of oleic acid the solubility of the soap in benzine is increased. For brushing on the slab, an ordinary hard oil soap may be employed, green olive-oil soap being perhaps the most satisfactory. A brush dipped in benzine, and rubbed on a bar of this soap, dissolves enough to produce a plentiful lather when brushing the goods. When a solid or semisolid benzine soap is employed—e.g., Saponine—it is usual to make a stock solution (a 5 or 10% solution by weight) and to add the necessary amount of the stock to the machine. For use in the Barbe process, neutral soaps must be employed, those containing free acid being found to attack the galvanized fittings at the temperature to which the machine is raised.

**Egg-Yolk Soap.**—Cocoanut oil, 8 lb.; tallow, 8 lb.; yolks of 50 eggs added to olive oil, q. s. to make 4 lb.; soda lye, 38° B., 8 2-5-lb. Perfume with oil of lemon, 2 oz.; oil of cloves,  $\frac{1}{2}$  oz.; oil of sassafras,  $\frac{1}{4}$  oz. Color pale yellow. Good for the complexion.

**Elder Flower Soap.**—Half-palm soap, 100 lb.; dextrine, 3 lb. Perfume with oil of bergamot, 8 oz.; oil of lavender, 2 oz.; oil of thyme, 2 oz.; oil of cloves, 1 oz.; oil of cassia,  $\frac{1}{2}$  oz.; oil of almonds,  $\frac{1}{2}$  oz. Color light green.

**Essence of Soap.**—Under this title various preparations are made, but they are all solutions of soap in warm alcohol, with, generally, the addition of a small quantity of potash. Soaps made from vegetable oils are preferred, because they remain clear and liquid when cold, whereas those prepared from animal fats become solid in cooling. Dussance gives the following formula for preparing this soap: White Marseilles soap, 6 $\frac{1}{4}$  oz.; alcohol at 85°, 1 qt.; potash, 6 dr. Cut the soap into fine shavings, and put them into a bottle holding about  $\frac{1}{4}$  gal. (a Winchester bottle would suit admirably); add the alcohol and potash, and mix gently, without boiling, over a water bath; stir with a glass rod. When the solution is complete take it out of the water bath and add the essences. A very sweet perfume may be given to this preparation by adding to it oil of geranium, 1 $\frac{1}{2}$  dr.; oil of verbena, 2 $\frac{1}{2}$  dr. To color yellow, add 2 $\frac{1}{2}$  dr. of saffron. This essence continues limpid at the ordinary temperature. To use it, pour a little into  $\frac{1}{2}$  tumblerful of water, and stir quickly.

**Extract of Soap.**—Soap, 14.3 parts; anhydrous soda, 30 parts; water, 55 parts. Manufactured from soda crystals and soda soap.

## Soaps and Candles

### (Floating Soaps)

**Floating Soaps.**—1.—Floating soaps can be prepared according to various methods, of which two will suffice—the preparation from fresh materials and the preparation from trimmings from coconut-oil soap. This latter will probably give a very welcome opportunity to many manufacturers to advantageously dispose of the heaps of trimmings often left over. The following is a formula for preparing a white floating soap from fresh materials. The color of the soap will, of course, depend largely on the quality of the oil used. Coconut oil, 88 lb.; soda lye, 38° B., 46.2 lb.; potash lye, 25° B., 2.2 lb. Melt the coconut oil in the usual manner, filter into capacious jacketed kettle, or one placed in a water bath, and heat to about 122° F. Then add the lye, stir well for about 10 minutes, and then cover up the kettle. Allow to saponify, and then thoroughly stir again. The soap will now have the appearance of fine woolly grains. In the foregoing process but little fire or steam is necessary. Twenty-two pounds of well warmed calcium chloride solution of 20° B., and 88 lb. of hot water, are now gradually added, with constant stirring, to the curd in the kettle. The soap is worked up thoroughly to complete solution, but very little heat is required, as it is not necessary to make the soap boil. After obtaining complete solution, take a lye cylinder full of the soap solution from the kettle, allow it to cool to 77° F., and sink a lye hydrometer in the liquid, when this will indicate a density of 50° B. This particular degree will yield a floating soap having a medium weight. The soap solution is then allowed to cool to 77° F., and a stirring kettle filled about one-third full with the cooled soap. This aqueous fluid mass is then stirred vigorously until transformed to a stiff foam, and is then put into the flames at once. The prescribed temperature of 77° F. must be carefully adhered to, for if heated to a higher temperature, say 100° F., or over, much more time will be required to work up the liquid into a permanent foam, and through the long stirring the foam would be so puffed out that the resulting soap would be too light. On the contrary, if allowed to cool too much, the soap obtained will be too heavy, because the formation of the foam takes place too rapidly, and the soap is not allowed sufficient time to swell in the kettle. Floating soap should not be dried in a warm room nor in a drying oven, as, if this is done, the soap will shrink a great deal and become fissured. It is better to allow the entire block, as

### (French Soaps)

it comes out of the form, to stand for several weeks in an airy, light place, then cut into tables, allow them to dry for several days, and then cut up into bars or cakes.

2.—Another process, that of making floating soap from trimmings, is quite simple. For instance, place 220 lb. of the trimmings or scraped from coconut-oil soap in a jacketed kettle or on a water bath. To dissolve this, about 33 lb. of potassium chloride solution of 20° B., and about 132 to 154 lb. of water, should be added to the scraps in the kettle, the quantity of solution and water required being, of course, dependent on the degree to which the scraps have dried out. Considerable heat is applied at first, and the scraps diligently broken up to facilitate their solution. Strips and cubes of soap should have previously been passed through a planing machine. When very old, dry scraps are used, it will frequently prove very difficult to effect their solution. In this case, solution can be accelerated by stirring over the above quantity of soap from 2 to 4½ lb. of salt.

The trimmings of coconut-oil soap mentioned in the above process should not be from filled soap, as such, filled, for instance, with water glass and soda crystals, are not suitable for floating soap. The material used for filling renders the soap brittle and coarse, and when cut and planed the surfaces of the bars and cakes do not become smooth. When used in too large quantities, salt causes the same result in floating soaps. These filling solutions have also an influence when measuring the degree of density of the soap solution.

**Frangipani.**—Curd soap, previously colored pink, 7 lb.; civet, ¼ oz.; otto of neroli, ½ oz.; otto of santal, 1½ oz.; otto of rose, ¼ oz.; otto of vitivert, ½ oz.

**French Formula.**—The following formulae represent some of the fatty combinations used in different localities in France in the manufacture of soap:

1.—Olive oil, 675 lb.; earth nut oil, 675 lb.; lard, 900 lb.; total, 2,250 lb. This produces a white, odorless soap.

2.—Bleached palm oil, 1,575 lb.; oil of sesame, 450 lb.; white tallow, 225 lb.; total, 2,250 lb. Produces a very hard soap, of good quality, but not so white as the above. It turns slightly yellow by keeping.

3.—Olive oil, 450 lb.; white tallow, 1,350 lb.; earth nut oil, 450 lb.; total, 2,250 lb. This is considered to form a very good soap, and superior to that, of

## Soaps and Candles

### (Glycerine Soap)

Marseilles, but, unfortunately, it has a faint smell of tallow, which restricts its use in domestic economy.

4.—Olive oil, 675 lb.; coconut oil, 225 lb.; lard, 675 lb.; tallow, 675 lb.; total, 2,250 lb. This formula makes a good white soap, but the presence of coconut oil gives the soap a disagreeable odor, although it improves its lathering properties.

*Frost Soap*.—Ceylon coconut oil, 20 kgm.; soda lye, 38° B., 9 kgm.; camphor, 1 kgm. Dissolved in 96% spirit, 2½ l.; flowers of sulphur, 1 kgm.; potash lye, 39° B., 1 kgm.

*Glycerine Soap*.—1.—Melt any mild soap, and mix glycerine intimately with it, in the proportion of 1-20 to 1-25 of the weight of the soap, to form plain glycerine soap. Perfume with oil of bergamot or rose geranium, mixed with a little oil of cassia, to which sometimes a little oil of bitter almonds may be added.

2.—Mutton tallow, 44 lb.; coconut oil, 44 lb.; castor oil, 22 lb.; pure glycerine, 22 lb.; caustic lye, 40° B., 27 lb.; 96% alcohol, 48.4 lb.; water, 9.9 lb. Melt the grease at 104° F., and add the alkali by slow degrees, keeping the heat low to prevent evaporation, and stir constantly. When the lye has become absorbed, after 3 or 4 hours' stirring, add the alcohol, which should be warmed; stir until it becomes clear, then add the glycerine, and when mixed the water and perfume.

3.—Lilac-Glycerine Soap.—Cochin coconut oil, 67 kgm.; compressed tallow, 31 kgm.; castor oil, 35 kgm.; caustic soda lye, 39° B., 66 kgm.; sugar, 40 kgm. Dissolve in water, 40 kgm.; alcohol, 30 kgm.; methyl violet, 2 grams; terpineol, 1,200 grams; coumarin, 20 grams; artificial musk, 10 grams; ylang-ylang oil, 20 grams; geranium oil, 35 grams; civet tincture, 100 grams.

4.—Liquid Glycerine Soap.—a.—Oleic acid, 187 lb.; coconut oil, best, 33 lb.; potash lye, 35° B., 114 lb.; glycerine, 10 lb. The ingredients are saponified at a gentle heat, and sufficient alcohol at 95° added to make the soap clear.

b. Castile soap, 200 parts; potassium carbonate, 5 parts; glycerine, 300 parts; alcohol, 500 parts. To the solution made from the above add 200 parts of alcohol, filter, and add 2 parts of oil of bergamot or lemon.

c.—Soft soap, 650 parts; glycerine, 270 parts; alcohol, 100 parts; oil of bitter almonds, 40 drops per liter.

d.—Spirit of soap and glycerine, of each 50 parts; oil of bergamot, 30 drops per liter.

### (Glycerine Soap)

e.—Olein, 500 parts; alcohol, 100 parts; potash lye, 33 1-3%, 280 parts; potash carbonate, 50 parts; glycerine, 1,570 parts; water, 100 parts. Place the olein, alcohol and potash lye in a glass, and warm on a water bath for half an hour, agitating frequently. Add the potassium carbonate, dissolved in the water, and continue the heat until a sample of the soap is perfectly soluble in hot water. Now warm the glycerine, and mix with the soap; allow it to stand for several days in a cool place, filter, and finally add any desired perfume.

5.—Spike-Glycerine Soap.—Cochin coconut oil, 70 kgm.; compressed tallow, 40 kgm.; castor oil, 70 kgm.; caustic soda lye, 38° B., 70 kgm.; sugar, 40 kgm. Dissolved in water, 40 kgm.; alcohol, 45 kgm.; patchouli oil, 100 grams; lavender oil, 400 grams; spike oil, 200 grams; geranium oil, African, 100 grams; Palmarosa oil, 100 grams.

6.—Transparent Glycerine Soap.—a.—Fresh tallow, 20 lb., and best coconut oil, 10 lb., are heated at 167° F. On the other hand, 15 lb. of solution of caustic soda, 40° B., or sp. gr. 1.384, 12 lb. of 96% alcohol, 15 lb. of glycerine, 6 lb. of brown sugar and 2 lb. of water are mixed, likewise heated to 167° F., and the mixture gradually mixed with the former, under brisk stirring. Saponification takes place in this manner, without the necessity of boiling. The reaction is accompanied by a considerable increase in bulk. It may then be covered, and after it has become a little cooler, it may be scented; finally, it is transferred to molds, which must be so placed that the soap cannot congeal quickly.

b.—Dry bar soap, 100 lb., to be heated and melted; then pour in 25 lb. or more of melted sal soda. Agitate together at a low heat. Then add 100 to 125 lb. of glycerine; agitate, keeping up a moderate heat. Let settle; draw off into molds or soap frames. When cold, cut into bars and cakes.

7.—Violet-Glycerine Soap.—Cochin coconut oil, 66 kgm.; compressed tallow, 31 kgm.; castor oil, 35 kgm.; caustic soda lye, 38° B., 60 kgm.; sugar, 35 kgm. Dissolved in water, 30 kgm.; alcohol, 40 kgm.; brown, No. 120, 160 grams; bergamot oil, 450 grams; iris oil, 70 grams; Peru balsam, 450 grams; tincture of benzoin, 3,500 grams; tincture of musk, 200 grams; terpineol, 210 grams; vanillin, 10 grams.

*Grease, To Preserve*.—To preserve soap grease, fill a cask half full of good strong

## Soaps and Candles

### (Industrial Soaps)

lye, and drop all refuse grease therein. Stir up the mixture once a week.

**Honey Soap.**—1.—Curd soap, 900 parts; potash soap, 100 parts; oil of citronella, 15 parts. Melt together, and add a sufficient quantity of burnt sugar coloring to produce a light brown color. If genuine honey soap is wanted, which, by the way, is seldom found in the market, 100 parts of clarified honey may be substituted for the potash soap.

2.—White Marseilles soap, 4 oz.; honey, 4 oz.; benzoin, 1 oz.; storax,  $\frac{1}{2}$  oz. Mix well in a marble mortar. When thoroughly mixed, melt over a water bath, pass through a fine sieve, and run into molds. Divide into cakes.

3.—The article commercially vended under this name rarely contains any honey. It may be prepared as follows: Palm-oil soap and olive oil, of each 1 part; curd soap, 3 parts; melt together. Perfume with oil of yerbena, rose geranium or ginger grass.

**Industrial Soaps.**—Industry uses an enormous quantity of diverse sorts of soaps in the fulling of woolens, in the dyeing and printing of textiles, the scouring of fleeces, etc. Some of these have a soda base, others one of potash; the latter is to be preferred, as it gives the goods a silky feel, whereas soda, on the other hand, makes them somewhat harsh to handle. These soaps are sometimes made with oleic acid, sometimes with olive oil; the former are often the most alkaline, but this is because all necessary precautions in their manufacture have not been taken. Still, all soaps intended to be used industrially should be absolutely pure and neutral, as an excess of potash or of soda is harmful to the majority of textiles. As for foreign matters, they are equally hurtful, even rosin and silicate of soda, which can be employed so usefully for household soaps. The former of these articles gives to woolens, silk or cotton stuffs a shiny and greasy look that is unfavorable to the mordanting, dyeing and finishing of the goods. Silicate cuts the superficial fibers and robs the tissue of strength. For these reasons, manufacturers who use soap in their business have it analyzed frequently, and keep themselves informed concerning the composition of the particular sorts they purchase, so that they generally get them pure.

1.—**Fulling Soap.**—Used for cleansing and scouring woolen fabrics. It is a soft soap, of the composition of—

a.—Fatty acids, 50; potash, 11.5; water, 38.5.

### (Industrial Soaps)

b.—Fatty acids, 40; potash, 9.5; water, 50.5. It should contain a slight excess of alkali, but no rosin, starch or silicate.

c.—For use in woolen manufacture, a genuine potash oil soap has been found in practice superior to all others. Rosin gives harshness to the fiber of the wool, so must not be used. Soda also injures the suppleness of the wool, and should be discarded. The natural lubricant of wool, called suint, is a kind of potash soap, containing a bare trace of soda. Silicates also must not be used; if present, they are decomposed in the process of fulling, and deposit free silica, which grates on the fiber and injures its luster.

2.—**Silks and Printed Goods.**—The late Professor Crace-Calvert, of Manchester, Eng., to whose indefatigable exertions in industrial chemistry manufacturers were indebted for much valuable information, suggested the following formulæ for soaps to produce the highest brightening effect upon the various shades of color:

a.—For Madder Puples.—Fatty matter, 60.1%; soda, 5.6%; water, 34%.

b.—For Madder Pinks.—Fatty matter, 59.23%; soda, 6.77%; water, 34%.

c.—For bleaching raw silk, white olive-oil soap is used on the Continent.

d.—Oleic acid, saponified by potash lye, is a very suitable fatty material for making soft soap. The first potash lye should have a strength equal to about 20° B., and the soap may be finished with a stronger lye—from 25 to 28°.

3.—**Textile Industries.**—a.—Tallow, 80 lb.; cotton-seed oil, 80 lb.; bone fat, 80 lb.; coconut oil, 100 lb.; caustic soda, 75 lb.; salt, 32 lb.

b.—Tallow, 80 lb.; peanut oil, 120 lb.; bleached linseed oil, 40 lb.; palm-kernel oil, 120 lb.; caustic soda, 80 lb.; salt, 36 lb.

c.—Cotton-seed oil, 80 lb.; peanut oil, 80 lb.; bone fat, 80 lb.; palm-kernel oil, 120 lb.; caustic soda, 80 lb.; salt, 35 lb.

d.—Saponified oleic acid, 100 lb.; tallow, 40 lb.; palm-kernel oil, 60 lb.; caustic soda, 40 lb.; salt, 20 lb.

e.—**Soft Soap.**—(1) Tallow, 65 lb.; crude palm oil, 10 lb.; saponified oleic acid, 75 lb.; cotton-seed oil, 40 lb.; bleached linseed oil, 10 lb.

(2) Tallow, 100 lb.; horse fat, 100 lb.; saponified oleic acid, 100 lb.; crude palm oil, 20 lb.; cotton-seed oil, 80 lb.

(3) Tallow, 8 lb.; bleached palm oil, 6 lb.; saponified oleic acid, 14 lb.; peanut oil, 9 lb.; bleached linseed oil, 3 lb.

f.—The firm of Trawitz, Dueringer & Co., Strassburg, Alsace, manufacture a soap for use in the textile industry which



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### (Laundry Soaps)

it is claimed meets the highest requirements, and perfectly replaces the best Marseilles soap. This Luetzelburg textile soap, as it is named, according to the analysis made in the laboratory of the *Stiefensieder Zeitung*, contains fatty acid, 65.2%; soda, 7.6%; water, 27.2%; total, 100%. The fat is completely saponified, and the soap absolutely neutral, and, therefore, suitable for any purposes of the textile industry.

**Laundry Soaps.**—1.—Labor-saving Soap.—To make it, take 2 lb. of sal soda, 2 lb. of yellow bar soap, 10 qt. of water, or in like proportion. Cut the soap into thin slices, and boil all together 2 hours, and then strain through a cloth into a tight box or tub; let it cool, and it is fit for use. Do not let it freeze. To use it, put the clothes to soak the night before you wash. The next morning put your water into your kettle or boiler. To every 2 pailfuls of water add about 1 lb. of the soap. As soon as the water with its dissolved soap begins to boil, wring out the clothes from the water in which they have been at soak during the night, and put them into the boiling water without any rubbing. Let them boil 1 hour, then suds and rinse them, and they will be clean and white. They will need no rubbing, except a little on such pieces as are soiled, and for that no washboard will be required. The clothes should be rinsed in 2 waters. Colored and woolen cloths must not be boiled as above, but may be washed in the suds, weakened with water. The clothes will last longer by the use of this soap, and much labor will be saved. Sal soda, 6 lb., bar soap, 6 lb., and water, 30 qt., will make about 50 lb. of the soap. The soda costs about 8 cents a pound, and the bar soap 8 cents a pound. A pint measure will hold a pound of the labor-saving soap. This will save the trouble of weighing every time.

2.—Lard Soap.—This soap is prepared by the cold process, as follows: Melt 112 lb. of lard by gentle heat, and add half the lye prepared by dissolving 56 lb. of caustic soda to mark 36° B. Agitate well, without allowing the mixture to boil, and when it is thoroughly incorporated, the remainder of the lye is gradually introduced. The temperature is kept under 149° F. When the paste has sufficient consistency, and has no greasy feel, when pressed between the fingers, it may be pressed into frames. The desired perfume is added while the soap is in the pasty state. In about 2 days it will have become sufficiently solid to be cut into

### (Laundry Soaps)

tablets and pressed. This soap is very hard, and of a brilliant whiteness.

3.—Marine Soap.—Fuller's earth, 40 parts; calcined soda ash, 40 parts; coconut-oil soap, 80 parts. Used for washing in sea water.

4.—Perfumes in Laundry Soaps.—To find an oil which will effectually cover the rosin and coconut odor in common soaps has been the aim of the laundry soap maker for many years. Of course there are oils which will do it, but which is preferable—mirbane or coconut, or citronella? There has been an oil used in Europe quite extensively to overcome this. It is the oil of pennyroyal. (*Ol. Mentha Puleggi*, not *Oleum kadcoma*.) The latter is the American pennyroyal, as different from the French oil as day is from night. It is stronger than the majority of oils used by soap men, stronger even than mirbane, and has no obnoxious odor. Belonging, as the name indicates, to the family of mints, it has that characteristic odor, backed by a greater amount of "natural" oil camphor, which helps to hold and diffuse the odor. In itself it would not make a good perfume, but mixed with other oils it does the work. The following formulas are recommended, and if proper care is used in their preparation there is little doubt of success:

a.—Mixture for White Soap.—Oil of French pennyroyal, 3 lb.; oil of thyme, white, 1 lb.; oil of lavender flowers, 1 lb.; oil of caraway chaff,  $\frac{1}{2}$  lb. Mix, and use 1 lb. to 325 lb. of soap. The cost of the above is about \$1.10 a pound, and it can be used to a good deal more soap, only the house using it, making 1-lb. cakes, wanted a strong odor.

b.—For Colored Soap.—Oil of French pennyroyal, 1 lb.; oil of cassia, 1 lb.; oil of cloves,  $\frac{1}{2}$  lb.; oil of lavender spike, 1 lb. Mix, and use the same as above.

5.—Rubbing, Soap to Clean Clothes Without.—Take 2 lb. of sal soda, 2 lb. of yellow bar soap and 10 qt. of water. Cut the soap into thin slices, and boil together 2 hours; strain, and it will be fit for use. Put the clothes in soak the night before you wash, and to every pailful of water in which you boil them add 1 lb. of soap. They will need no rubbing, but merely rinsing.

**Lead Soap or Simple Plaster.**—Parts by weight: Pulverized litharge, 1; axunge (pig's lard), 1; olive oil, 1; water, 2. The lard, oil and water are put into a copper vessel, of which the capacity is three times greater than the volume of the materials. The mixture is melted over a gentle fire; the litharge is

## Soaps and Candles

### (Liquid Soap)

added through the sieve, and stirred up with a wooden rod. The boiling is kept up by adding warm water from time to time as evaporation proceeds. The materials are stirred up constantly with the wooden rod until the oxide of lead has altogether disappeared, and until the mass has taken a uniform white color and a consistency of plaster, which is gauged by throwing a small quantity of the contents of a pan into cold water and rubbing it between the fingers. The mass is then removed from the fire, and, while still warm and soft, is kneaded to eliminate the water.

**Leaves, Soap.**—Glycerine, 10 parts; alcohol, 30 parts; dry glycerine soap, 60 parts; ordinary neutral soap, 50 parts; to form the mixture with which the paper is impregnated. This is effected in a trough containing the mixture, which is kept at a temperature of 165 to 180° F. In the trough there are three rollers, driven by steam or other power, revolving in the same direction, and over the under side of which the paper is passed. While under treatment the paper is sprayed with small quantities of oil of turpentine, which causes it to dry more rapidly, and also imparts to it an attractive glossy appearance.

**Lemon Soap.**—White soap, 50 lb.; starch, 2 lb. Perfume with oil of lemon, 4 oz.; oil of bergamot, 2 oz.; oil of lemon grass, 2 oz.; oil of cloves, 1 oz. Color light yellow with cadmium yellow.

**Lettuce Soap.**—Lard with lettuce, 20 lb.; cassia pomade, 10 lb.; spermaceti, 5 lb.; castor oil, 5 lb.; bleached palm oil, 10 lb.; caustic lye, 36° B., 26 lb.; gum tragacanth, 3 oz. Perfume with oil of bergamot, 6 oz.; oil of thyme, 2 oz.; oil of valerian, 1 oz.; oil of cloves, 1 oz. Color, light green. The lard with lettuce is made by melting the lard with its own weight of lettuce leaves, keeping it at the melting point, about 80° F., for some hours, or until the leaves have parted with their color and juice. Then steam off for use.

**Lily Soap.**—Wax soap, 1,500 parts; starch, 150 parts; oil of bergamot, 8¼ parts; oil of sandalwood, ¼ part; oil of geranium, 3¼ parts; oil of cassia, ¼ part; tincture of musk, 1½ parts; tonka bean, 1½ parts; tincture of storax, 5 parts.

**Liquid Soap.**—Many of the advantages that would accrue from the use of liquid soap, in hospital wards, and in public places generally, are self-evident. The detergent properties of this form of soap, combined with the general sense of safety

### (Liquid Soap)

and cleanliness that must accompany the use of an absolutely fresh particle of soap at each using, are perhaps the more prominent among these evident reasons why, when once introduced, the use of liquid soap is destined to displace the cake variety in public lavatories and in practically all places where two or more persons are expected to use the same soap. One of the objections to the more widespread use of liquid soap, even at the present time, is the comparatively high cost of this form of preparation, largely due to the cost of the ethyl alcohol necessary in making the solution. Methyl alcohol, while cheaper, offers serious objections, and its use, in view of the many reported cases of untoward results, even from the inhalation or the external application of comparatively small quantities, is not permissible. Being desirous of securing a liquid preparation with a minimum of alcohol, a series of experiments were inaugurated that resulted in the apparent discovery that a mixture of soda and potash soaps is much more soluble in water and much more stable, in any given dilution, than either one of its constituents. Elaborating on this discovery, a formula has been devised that produces a uniformly satisfactory product, and one that, made from purified cottonseed oil, will not cost more than 50 cents a gallon, buying in quantities such as an ordinary retail druggist would be likely to use.

1.—The formula now in use is as follows: Sodium hydrate, 40 grams; potassium hydrate, 40 grams; cotton-seed oil, 500 c.c.; alcohol, 250 c.c.; distilled water, enough to make 2,500 c.c. In a suitable container, preferably a glass-stoppered bottle, dissolve the potassium hydrate and the sodium hydrate in 250 c.c. of distilled water, add the alcohol, and then add the cotton-seed oil in 3 or 4 portions, shaking vigorously after each addition. Continue to agitate the mixture occasionally until saponification has been completed. Then add the remaining portion of distilled water, and mix. The only precautions that are at all necessary are to use U. S. P. grade of ingredients, and to be sure that saponification is complete before adding the remaining portion of the distilled water. The water used must be absolutely free from soluble salts of the alkaline earths or the heavy metals, and for this reason should be, preferably, freshly distilled. The soap can be readily made more alkaline, and it can also be made with an appreciably smaller quantity of the alkali. For gen-

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### (Liquid Soap)

eral use as a toilet soap it would be necessary to give it some distinctive odor. This can be accomplished by replacing a portion of the water with distilled extract of witch hazel, rose water, or orange-flower water, or by adding the necessary perfume, spirit or essential oils to suit the individual taste or need.

**Manufacture of Soap in Small Quantities without Boiling.**—Take exactly 10 lb. of double refined 98% caustic soda powder (Greenbank), put it in any can or jar with 45 lb. (4½ gal.) of water, stir it once or twice, when it will dissolve immediately and become quite hot; let it stand until the lye thus made is cold. Weigh out, and place in any convenient vessel for mixing, exactly 75 lb. of clean grease, tallow, or oil (not mineral oil). If grease or tallow be used, melt it slowly over the fire until it is liquid and just warm—say, temperature not over 100° F. If oil be used, no heating is required. Pour the lye slowly into the melted grease or oil in a small stream, continuously, at the same time stirring with a flat wooden stirrer about 3 in. broad; continue gently stirring until the lye and grease are thoroughly combined and in appearance like honey. Do not stir too long, or the mixture will separate itself again. The time required varies somewhat with the weather and the kind of tallow, grease or oil used; from 15 to 20 minutes will be enough. When the mixing is completed pour off the liquid soap into any old square box for a mold sufficiently large to hold it, previously dampening the sides with water so as to prevent the soap sticking. Wrap up the box well with old blankets, or, better still, put it in a warm place until the next day, when the box will contain a block of 130 lb. of soap, which can afterward be cut up with a wire. Remember the chief points in the above directions, which must be exactly followed. The lye must be allowed to cool. If melted tallow or grease be used, it must not be more than warm. The exact weights of double refined 98% powdered caustic soda and tallow or oil must be taken; also the lye must be stirred into the grease, not grease or oil added to the lye. If the grease or tallow used be not clean, or contains salt, it must be rendered, or purified, previous to use; that is to say, boiled with water, and allowed to become hard again to throw out the impurities. Any salt present will spoil the whole operation entirely, but discolored or rancid grease or tallow is just as good as fresh for soap-making purposes. If the soap turns out streaky and uneven,

### (Liquid Soap)

it has not been thoroughly mixed. If very sharp to the taste, too much soda has been taken. If soft, mild and greasy, too little soda has been used. In either case, it must now be thrown into a pan, and brought to a boil with a little more water. In the first case boiling is all that is necessary; in the other instances a very little oil, or a very little more of the double refined powdered caustic soda must be added to the water. These things will never happen, however, if the directions are exactly followed, and after the soap has been made several times, with the experience thus gained, the process is extremely easy, and the result will be always a good batch of soap. Beef tallow makes the hardest soap, mutton fat a rather softer soap; of oils, cotton-seed is the cheapest and best, but the soap is much softer, lathering very freely indeed. Ordinary household fat or dripping will make a nice soap, and in many places can be obtained at a very trifling cost, and in exchange for goods sold. Such grease, however, must be carefully examined for salt, which it often contains. It will be evident that any smaller quantity of soap can be made at a time, according to the above directions, by taking the ingredients in exact proportion. It is not advisable to make more than double the quantity prescribed, as it is difficult to work more by hand. By making successive batches, however, a single person can make 2 tons of soap in a day, simply with apparatus (pans, etc.) obtainable in any household.

By adding a few drops of essential oil just when the mixing is completed a toilet soap is produced. Oil of mirbane (artificial almond oil) is the cheapest, but the perfume is not nearly so pleasant as real almond oil, citronella or oil of cloves. If made with clean grease or tallow, or light-colored oil, the soap produced is quite white. Sometimes a little coloring matter will make the soap sell better, although of no better quality. Half an ounce of bichromate of potash dissolved in the lye will give a green; 1 lb. of palm oil melted with the tallow or oil, a yellow color; or a good brown can be got by burning ½ lb. of sugar in a saucepan until black, then dissolving it in a pint of water, and adding it to the melted tallow before mixing.

A very cheap and good jelly soft soap can be made with above soap. Take 5 lb. of the hard soap, crush it down or cut it up into as small pieces as possible; put this into a pan or boiler with 10 gal. of water, if a strong, hard tallow soap; if

## Soaps and Candles

### (Lye)

an oil soap, only half the quantity of water (5 gal.); just bring it to a boil, and stir well to thoroughly dissolve all the pieces of hard soap; pour or ladle it into any can, tub or barrel that is tight, and leave it to cool for 2 or 3 days. This will give about 80 lb. of jelly soft soap at an exceedingly small cost. Of course, if made from colored and scented hard soap, it will be a colored and scented jelly soap. This is a good way of working up the scraps and bits of soap after cutting up. It can be sold with a good profit at a very low figure, and often as a substitute for regular soft soap. It is a very different article, however, to a real potash soft soap, which should invariably be used for washing woollens. It is possible to produce this real potash soft soap in the cold by a somewhat similar process to the above.

2.—According to credible authority, these soaps can only be obtained by treating hard soaps with a base of pure olive oil, which are dissolved in alcohol with the final addition of a certain quantity of potassium carbonate. Grate the soap fine and put it into a receptacle over a water bath, together with the alcohol and the carbonate, stirring constantly, and letting the temperature rise little by little. At the end of at least an hour the solution is complete, and perfectly transparent, if white soap has been used. Perfume may be added to suit the taste, but it must be done at the moment when the decoction is removed from the bath. The alcohol used ought to be 80° proof.

3.—Clark's Soap Solution.—Dissolve 5 grams of Castile soap in  $\frac{1}{2}$  l. of dilute 36% alcohol. Used to test the hardness of water. (See also *Naples Soap*.)

*Lye*.—Hickory ashes are the best for making common washing soft soap (when it is not desirable to use the potash lye), but those from sound beech, maple, or almost any kind of hard wood, except oak, will answer well. A common barrel set upon an inclined platform makes a very good leach, but one made of boards set in a trough in V-shape is to be preferred, for the strength of the ashes is better obtained, and it may be taken to piece when not in use, and laid up. First, in the bottom of the leach put a few sticks; over them spread a piece of carpet or woollen cloth, which is much better than straw; put on a few inches of ashes and from 4 to 8 qt. of lime; fill with moistened ashes, and tamp down well, tamping firmest in the center. It is difficult to obtain the full strength of ashes in a barrel without removing them after a day's leaching,

### (Medicinal Soaps)

and mixing them up and replacing. The top should first be thrown off and new ashes added to make up the proper quantity. Use boiling water for second leaching. This lye should be sufficiently strong to float a potato.

*Marshmallow Soap*.—White curd soap and palm-oil soap, of each 40 lb. Color with yellow ochre, 4 oz.; orange mineral, 4 oz.; gamboge,  $1\frac{1}{4}$  oz. Perfume with oil of lavender, 10 oz.; oil of lemon, 2 oz.; oil of neroli, 2 oz.; oil of verbena, 10 oz.; oil of mint, 3 oz.

*Medicinal Soaps*.—1.—In medicine and pharmacy, soaps are used for various purposes with a base of alkali or alkaline earths; the first are soluble, the others insoluble. Among the soluble soaps—that is to say, those with a base of potash, soda or ammonia—there are three descriptions: First, those which contain substances capable of giving them new properties without taking away those which are proper to them; second, medicaments made by adding extracts to soap powder; third, alcoholic preparations containing enough soap to make a sort of jelly. The insoluble soaps have generally oxide of lead as a base, and are known as plasters, salves, or ointments. They are prepared with or without water, and in certain cases at a temperature far beyond the boiling point. They then take a brown color by reason of the alteration of a part of the fatty body.

2.—Base.—The base for medicated soaps is constructed upon the following formula, which is termed "basic soap" (*base sicc*): Mutton suet, best quality, 593 parts; olive oil, 74 parts; caustic soda, 222 parts; caustic potash, 111 parts. Mix, and make a soap.

3.—Essential Oils.—A series of medicinal soaps is made containing such essential oils as are possessed of antiseptic virtues. Among these may be mentioned wintergreen, pine and eucalyptus oils, while also thymol and terebene might be placed in the same class. The first three may, perhaps, be considered more as hygienic toilet than medicinal soaps; they are particularly suitable as preventives of freckles, pimples, tan, chaps, etc., and for improving the complexion. The thymol soap (2 to 5%) has been employed to sweeten suppurating wounds and ulcers, and to treat herpes and other allied diseases; it is a mild and agreeable antiseptic applications.

4.—Oil of sweet almonds, by weight, 21 parts; soapmakers' lye, by weight, 10 parts. The oil is put into a porcelain or glass vessel; the lye is added, little by

## Soaps and Candles

### (Medicinal Soaps)

little, and slowly, taking care to stir it until a complete mixture is obtained. The whole is then kept for several days at a temperature of from 18 to 20° C., and the mixture is stirred from time to time with a glass rod until it has acquired the consistency of a soft paste. It is then run into porcelain molds, from which it is taken out when it is entirely solidified. This soap should not be used in medicine until it has lost the excess of alkali which it retains after its preparation, and this will occur after it has been exposed to the air for 1 or 2 months.

5.—**Arsenic Soap.**—Parts by weight: White soap, 625; arsenic, 500; quicklime, 10; camphor, 60; water, 625. The soap is dissolved in the water, warmed, and the other substances are added, mixing the whole with care.

6.—**Camphor Soap.**—Parts by weight: White soap, 500; camphor, 8; blanched bitter almonds, 60; tincture of benzoin, 40. The almonds are reduced to a paste, the camphor is added, then the mixture of benzoin and the soap; and the mixture is molded in the water bath.

7.—**Carbolic Soap.**—Cocanut oil, 20 lb.; tallow, 4 lb.; soda lye, 38 to 40° B., 12 lb.; phenol, 1 lb. Prepare the soap by stirring the liquefied fat into the lye at 113° F., and when combination has set in, incorporate the phenol, and quickly pour into molds. Cover the latter well. Instead of the phenol, 2 lb. of sulphur may be used, and a sulphur soap made.

8.—**Creolin Soap.**—For treatment of contagious impetigo, itch, intertrigo and hyperidrosis: Basic soap, 95 parts; creolin, 5 parts. Mix.

9.—**Ergotin Soap.**—Used in cases of arterial hyperæmia of the skin (such as acne rosacea, congelations, varicose eczema, cicatrices marked by vascular dilatation, etc.): Basic soap, 95 parts; ergotin, 5 parts. Mix.

10.—**Grease Soap.**—Parts by weight: Veal suet, 50; soapmakers' lye, 25; distilled water, 100; sea salt, 10. The suet and the water are heated together in a porcelain capsule. After fusion the lye is added, little by little, stirring constantly. The heat and the stirring are maintained until complete saponification. The sea salt is then added, the solution being assisted by a very slight agitation. The soap which forms on the surface is taken off and drained. It is then melted at a gentle heat, and run into molds, where it solidifies on cooling.

11.—**Ichthyol.**—Another preparation which has also been largely used as soap, containing 5% of the sodium sulphichthy-

### (Medicinal Soaps)

olate. In this form ichthyol displays effectively its great power over affections due to or associated with a dilated condition of the vascular system. The soap is particularly prescribed in the treatment of eczema and rosacea. It has been found to exert a marked beneficial influence upon redness of the skin, and particularly the condition known as red nose. The latter property is also ascribed to a soap containing camphor (about 5%), which is a mild stimulant to the skin.

12.—**Iodine Soap.**—a.—Make a solution of 1 part of iodine of potassium in 3 parts of water; to this add of pounded Castile soap, 16 parts; melt in a porcelain vessel by the aid of a water bath.

b.—Sliced Castile soap, 1 lb.; potassium iodide, 1 oz.; dissolved in water, 3 fl.oz.; melt them together in a porcelain vessel, over a water bath.

c.—Cocanut oil, 10 kgm.; lye, 38° B., 5 kgm.; potassium iodide, 1½ kgm.; dissolved in water, ½ kgm.

13.—**Mercurial Soaps.**—a.—These are made by saponifying mercurial ointment. Thus, 10 oz. of mercury are gradually incorporated with 2 oz. of mercurial ointment, so globules are no longer visible with a lens; then 1 lb. 2 oz. of powdered soap are added, and 2 oz. of lard. A soap can also be made to contain, say, 5 per mille of sublimate, which is useful in the treatment of secondary syphilitic eruptions, of scabies, and of parasitical affections. Being free from unpleasant odor, it is preferable to some other antiseptic soaps. A preparation of this kind would also seem to be useful for cleansing the coats of domestic animals.

b.—**Sapo Hydrargyri.**—Dissolve 4 oz. of mercury in the same weight of nitric acid, without heat; melt in a porcelain basin, over a water bath, 13 oz. of veal suet, and add the solution, stirring the mixture till the union is complete. To 5 oz. of this ointment add 2 oz. of solution of caustic soda (sp. gr. 1.33) till a soap is formed which is completely soluble in water.

c.—**Sapo Hydrargyri Precipitati Albi** (Sir H. Marsh).—Beat 12 oz. of white Windsor soap in a mortar, add 1 dr. of rectified spirit, 2 dr. of white precipitate and 10 drops of otto of roses; beat the whole to a uniform paste.

d.—**Sapo Hydrargyri Precipitati Rubri** (Sir H. Marsh).—White Windsor soap, 2 oz.; nitrate of mercury (levigated), 1 dr.; otto of roses, 6 or 8 drops, in rectified spirit, 1 to 2 dr.; beat to a paste.

14.—**Phenic Acid Soap, Transparent.**—Parts by weight: Cocanut oil, 400;

## Soaps and Candles

### (Medicinal Soaps)

suet, 300; castor oil, 300; soapmakers' lye, 550; alcohol, 300; glycerine, 200; sugar syrup, 400; crystallized phenic acid, 80; palm oil, 5. The coconut oil and the suet are melted, and the castor oil is added, followed by the lye, mixed with the alcohol. To the paste thus made the phenic acid, liquefied beforehand, is added, and finally the palm oil. The whole is then run into molds.

15.—Plaster.—Brown soap plaster, or *Mère Thécie's* ointment, is prepared with the following ingredients, parts by weight: Olive oil, 10; lard, 5; butter, 5; yellow wax, 5; litharge, 5; mutton suet, 5; purified pitch, 1. The fatty materials are put into a big copper kettle, and warmed until they give off vapors indicating the alteration of the fatty bodies. The litharge is then added by passing it through a sieve, the whole being constantly stirred with a wooden rod. The mixture is left on the fire, continuing the stirring, until it has taken a dark brown color, and the pitch is then added. When the ointment is sufficiently cool it is run into pots or into paper molds.

16.—Quinine Soap.—Found to be valuable in pityriasis versicolor, in the treatment of which it is made into a lather, and the latter allowed to dry on the affected parts. Basic soap, 97 parts; quinine sulphate, 3 parts. Mix.

17.—Resorcin and Salicylic Acid Soap.—For the treatment of parasitic and seborrhoeic eczema; also of great service in psoriasis, acne and ichthyosis. Basic soap, 94 parts; salicylic acid, 3 parts; resorcin, 3 parts. Mix.

18.—Resorcin, Salicylic Acid and Sulphur Soap.—For use in acne vulgaris and acne rosacea, and in seborrhoeic eczema, marked by deep infiltration of the skin. Basic soap, 84 parts; resorcin, 3 parts; salicylic acid, 3 parts; sulphur, precipitated. Mix.

19.—Resorcin, Salicylic Acid, Sulphur and Tar Soap.—For use in squamous eczema and psoriasis vulgaris. Basic soap, 79 parts; resorcin, 3 parts; salicylic acid, 3 parts; precipitated sulphur, 10 parts; liquid tar, 5 parts. Mix.

20.—Salicylic Acid and Creosote Soap.—Salicylic acid, 5 parts; creosote, 2 parts; basic soap, 93 parts. Mix. This soap has been found of great service in the treatment of lupus, psoriasis, seborrhoeic eczema, parasitic syphilis, favus and tinea tonsurans.

21.—Soft Soap, Medicinal.—Made from pure olive oil, saponified with a caustic lye made from pure potash. The lye is added gradually and cautiously to the oil

### (Metallic Soaps)

during the boiling, and the greatest care taken to avoid an excess of alkali. When the mass assumes a transparent gelatinous appearance, the addition of lye is stopped. The boiling is continued until the soap has acquired the proper consistency.

22.—Sulphur Soap.—The best contains about 10% of very finely divided sulphur, and is perfumed, as the element gives a rather unpleasant smell to soap when used alone. Various combinations of tar, of naphthol or of iodides, etc., with sulphur, are also made, which are commended for various cutaneous disorders, pimples, comedones, freckles, etc.; sulphur, when continuously applied, tends to produce a clear and healthy complexion.

*Metallic Soaps.*—Metallic soaps are obtained by means of double decomposition. First, a soap solution is produced, which is brought to a boil. On the other hand, an equally strong solution of the metallic salt of which the combination is to be made (chlorides and sulphides are employed with preference) is prepared, the boiling solutions are mixed together, and the metallic soap obtained is gathered on a linen cloth. The same is then put on enameled plates and dried, first at 40, later at 60° C.

1.—Aluminum Soap is the most important of all. Dissolved in benzine or oil of turpentine, it furnishes an excellent varnish. It has been proposed to use these solutions for the varnishing of leather; they furthermore serve for the production of waterproof linen and cloths, paper, etc. Jarry recommended this compound for impregnating railroad ties to render them weatherproof.

2.—Copper soap enters into the composition of gilding wax. The same is also employed for bronzing plaster-of-paris articles. For the same purpose, a mixture is made use of consisting of copper soap and iron soap melted in white-lead varnish and wax.

3.—Iron soap is used with aluminum soap for waterproofing purposes and for the production of a waterproof varnish.

4.—Manganese soap is used as a siccativ in the preparation of linseed-oil varnish, as well as for a drier to be added to paints.

5.—Metallic rosin soaps may be produced by double decomposition of potash-rosin soaps and a soluble metal salt. From these good varnishes are obtained to render paper carriage covers, etc., waterproof; they may also be employed for floor wax or lacquers.

6.—By using wax instead of a soap,

## Soaps and Candles

### (Mottled Soaps)

insoluble metallic soaps are obtained, which, melted in oils or wax, impart brilliant colorings to them; but colored water-proof and weather-resisting varnishes may also be produced with them.

**Milk of Lilies Soap.**—This is of extraordinary cleansing power, and is free from escharotic or color-destroying properties. Its preparation is easy, and very simple, and consists in the saponification of the juice of the bulb of any lily, but more especially of the *Lilium candidum*. In its preparation the bulbs are grated up to a fine, creamy broth, or they may be mashed, according to pleasure or convenience. To the product add, under active and constant stirring, little by little, potassium or sodium lye, of 35° B., until a thick, foamy liquid is obtained. Experience demonstrates that to every 100 parts of the grated lily mass, from 50 to 60 parts of lye are necessary, and the time required for the rubbing up to be anywhere from 10 to 15 minutes. The solution can be solidified, and poured into molds by the addition of a warm solution of gelatine. This should be done gradually, or slowly. On cooling, the gelatine sets, and the soap can be removed from the molds in the usual way. As a matter of course, perfumes may be added to suit the taste of the individual.

**Mottled Soaps.**—1.—If, instead of a white soap, the object is to produce a mottled soap, impure soda, containing sulphides, is preferred for the lye, and a quantity of ferrous sulphate (green vitriol), about 8 oz. for each cwt. of oil, is added at the end of the preliminary boiling. This is at once precipitated, partly as iron oxide and sulphide, and partly as an insoluble iron soap. In consequence of this addition, and also from the presence of iron and sulphur in the lye, and of ferruginous matters from the pan, the curd obtained at the end of stage 3° has a uniform slate color. If this were allowed to remain the effect would not be pleasing; but instead of directing his endeavors to exclude these impurities, as in the case of the white soap, the soapmaker conducts the operation in such a way as to preserve and arrange them by diffusing the color in veins, in order to give a marbled or mottled appearance. When the proper consistency of the soap has been attained the mass is worked about with rakes, so as to bring the lower and darker colored parts of the curd to the top. When this has been sufficiently done the viscid soap is transferred to the frames, where, in about a week or more, according to the quantity, it cools down to

### (Mottled Soaps)

mottled soap. By varying the proportion of iron sulphate added, a tint is produced of a lighter or darker hue. By exposure to the air the iron gets oxidized to the state of sesquioxide, and a reddish tint, called *manteau Isabelle*, is diffused over the bluish mottled mass. It is thus apparent that in mottled soap the veins and patches of heavy, insoluble, colored compounds are present because, by special manipulation, they have been intentionally prevented from subsiding, and by the conveyance of the soap to the frames in so viscid a condition that the downward trickling of the colored impurities should proceed so slowly as only to intensify the desired appearance, and not subside altogether. It is evident also that if a soap so prepared were thinned by admixture with water, the impurities would more readily subside, and that the veining or mottling would be greatly diminished, or entirely prevented. Hence, a genuine mottled soap cannot contain more than 33 or 34, or at most 36%, of water. Hence, also, as a mottled appearance was formerly a special characteristic of Castile soap, and as this was essentially a good soap, a mottled or marbled character came to be regarded as a sign of excellence. So far was this belief carried, that it used to be said there was no need to analyze a marbled soap, as it must necessarily be genuine. This, however, is now by no means the case.

2.—Tallow, 30 kgm.; palm-kernel oil, 270 kgm.; lye, 20°. 347½ kgm.; potassium chloride solution, 20°, 37½ kgm. After everything has been boiled into a soap, crutch the following dye solution into it: Water, 5½ kgm.; blue, red or black, 315 grams; water glass, 38°, 10 kgm.; lye, 38°, 1½ kgm.

3.—Artificial Mottled Soaps. Blue, Gray and Red.—Blake & Maxwell's process may be used to produce these soaps. Two soap pans are required. In one of these a known quantity of tallow or bleached palm oil, or a mixture of 80% of coconut oil, 14% of tallow and 6% of lard, is boiled with a quantity of soda lye, carefully calculated with reference to the fats, and the hydrated soap thus formed is transferred to the other pan, in which a soft curd soap has been prepared from fatty matters and lye, as calculated by the strength of the alkali. The mottle is produced by adding to this soap, when in a finished state, coloring matter to impart the desired color, and in about half an hour after the soaps and coloring matter have been thoroughly incorporated the soap may be transferred

## Soaps and Candles

### (Musk Soap)

to the frames. For the best descriptions of mottled soaps the weight of fatty matters used to produce the hydrated soap amounts to from  $\frac{1}{4}$  to  $\frac{1}{2}$  the fat used to produce the soft curd. For cheaper descriptions, the hydrated soap may be increased till the proportion of fat in the hydrated soap amounts to from 2-3 to  $1\frac{1}{2}$  times the weight of fat in the curd soap. Another way is to prepare a fitted soap from the fatty mixture containing cocoanut or palm-kernel oil in one pan, and to remove it from the niger to the second pan. Here, for every 1,000 lb. of soap, are added 250 lb. of sodium silicate, and the whole is thoroughly incorporated by boiling, until the experienced workman judges that the proper condition for mottling has been attained. The coloring matters, mixed with water, are then sprinkled into the pan, and after boiling for a few minutes the mixture is transferred to the frames. The coloring matters are: For blue, artificial ultramarine, 5 to 10 lb. per ton; for gray, manganese oxide, 1 to 3 lb. per ton; and for red, vermilion.

4.—Mottled Balls.—Cut the soap (recently prepared, and not too dry) into dice, or small square pieces, roll them in colored powder (see below), and then mold them into balls by powerful pressure, observing to mix the colors as little as possible. The colors usually employed, and which should be in very fine powder, are:

- a.—Blue.—Indigo, powder blue, or smalts.
- b.—Green.—Powder blue and bright yellow ochre.
- c.—Orange.—Yellow, deepened with a little red.
- d.—Red.—Red bole, sesquioxide of iron, or jewelers' rouge.
- e.—Yellow.—Bright yellow ochre or Dutch pink.

By varying the color, by diluting it with a little farina or chalk, and by using soap dice separately coated with two or more colors, mottled savonnettes of any color, or mixture of colors, may be produced at will.

f.—Savonnettes of neroli: Melted curd soap, 12 lb.; orris powder, 1 lb.; orange powder, 3 oz.; oil of neroli, 12 dr.; essence of musk, 4 oz.; essence of ambergris, 4 oz.

*Musk Soap*.—1.—White curd soap, 60 lb.; palm-oil soap, 40 lb. Color with brown ochre or Spanish brown, 8 oz. Perfume with oils of musk and bergamot, of each 7 oz.; powder of cloves, pale roses and gilliflower, of each 9 oz.

### (Naples Soap)

2.—White tallow soap, 5 kgm.; pure palm soap, 5 kgm. Perfume with oil of bergamot, 50 grams; oil of roses, 5 grams; oil of cloves, 5 grams; oil of musk, 10 grams. The musk is prepared thus: Pound 10 grams of musk in a mortar, with an equal weight of sugar and 5 grams of pure potash; then add 160 grams of alcohol, gradually triturate for  $\frac{1}{4}$  hour, pour the mixture into a flask, and leave from 2 to 4 weeks, shaking it from time to time. Then filter, add the whole of the filtrate to the 10 kgm. of soap, and afterward the other perfume. Color with 80 grams of brown ochre.

3.—Best tallow soap, 30 lb.; palm-oil soap, 20 lb.; powdered cloves, pale roses and gilliflowers, of each  $4\frac{1}{2}$  oz.; essences of bergamot and musk, of each  $3\frac{1}{2}$  oz.; Spanish brown, 4 oz. Mix as soap & la rose. Very fine.

*Naphtha Soap*.—1.—A New Disinfectant.—In a work by Chopin, respecting the action of naphtha products, and especially of the naphtha acids, on micro-organisms, it is stated, on the authority of A. P. Lidow, that virulent disease germs can be easily destroyed by diluted emulsions of the naphtha acids. The latter can be readily saponified by soda or caustic soda, but will not yield solid soap. Fat or cocoanut oil is therefore added to it. The author recommends the addition of from 1 to 5% of the naphtha acids to the finished soap. By this process the soap retains its special character, and the acids, emulsified with the soap, their active properties.

2.—Liquid Naphthol Soap.—Sapon. domestic alb., sapon. kalini, ol. olivar. venal, aa, 1; aqua, 50; naphtholi, 0.25; ol. citri, q. s. Dissolve the soap in water, add the oil, shake frequently until the latter has also saponified, which is generally the case within 48 hours, and then dissolve the naphthol and lemon oil in the mixture. Finally, filter.

*Naples Soap*.—1.—The following mixture, which is perfumed with a little essence of thyme, sassafras, neroli or gilliflower, parts by weight: Amygdalin soap, 15; grease soap, 15; nutmeg butter, 8; cacao butter, 8; laurel water, 15.

2.—Liquid.—Take 12 lb. of shavings of good white soap and melt in 2 or 3 qt. of rose and orange-flower waters; add, to retain its liquidity, 2 lb. of oil aux fleurs, slightly boil the mixture, put in 4 oz. of powdered bergamot, peel for coloring, then strain, and perfume as for the soaps in tablets. In default of oil, when the soap is melted, add 2 qt. of good essence of soap; leave it for 15 minutes to thor-



## Soaps and Candles

### (Naturalists' Soap)

oughly incorporate, and then strain and perfume. If by age it becomes dry, moisten with a little rose or orange-flower water. The liquid soaps are susceptible of every variety of perfume.

**Naturalists' Soaps.**—**Arsenical Soap.**—1.—Arsenical soap is used by bird and animal stuffers to preserve the skins from the attacks of insects. It is prepared by the following formula: White soap, arsenious acid, and lime slaked by air, of each 4 oz.; carbonate of soda, 12 oz.; powdered camphor,  $\frac{1}{4}$  oz. The whole of these ingredients are worked up into a paste with pestle and mortar, a small quantity of water being added during the mixing.

2.—Arsenical Soap, Cosmetic.—Arsenicated soap: Arsenite of soda,  $\frac{1}{2}$  dr.; soft water, hot,  $1\frac{1}{2}$  oz. Dissolve, and add the solution to white Windsor soap, melted, 1 lb. Mix thoroughly, and form the mass into small cakes. The whole process should be performed in glass, porcelain or stoneware. Used by some ladies in fashionable life, under the idea that it promotes the softness, clearness and general beauty of the skin. Sometimes the solution is beaten up with the soap (in shavings), instead of being added to it in the melted state, with or without the addition of 1 to 2 dr. of powdered camphor. Arsenical soap is not recommended for toilet purposes.

3.—Powdered camphor,  $1\frac{1}{2}$  dr.; arsenic, 1 oz.; distilled water, 1 oz.; precipitated chalk, 1 oz.; soft soap, 2 oz.; carbonate of potash, 6 oz. Make the soap and water warm over a water bath, and then incorporate the chalk, arsenic and potassium carbonate. Add the camphor when cold.

4.—White soap,  $\frac{1}{2}$  lb.; pearlash, 3 oz.; powdered chalk, 1 oz.; camphor,  $\frac{1}{4}$  oz.; arsenic,  $\frac{1}{2}$  oz.; water, a sufficiency. Reduce the soap to fine shreds, and place in a water bath with a small quantity of water, stirring occasionally until dissolved. When quite liquid add the pearlash and chalk. Then remove the source of heat and add the arsenic gradually; rub in the camphor, in fine powder, when nearly cold. The product is of the consistency of soft soap.

5.—Curd soap, 4 lb.; carbonate of potash,  $\frac{1}{2}$  lb.; arsenic, 1 lb.; camphor,  $\frac{1}{2}$  lb. Dissolve the soap with a very little water, and add the other ingredients, powdered, and mixed together.

6.—Laurent's.—Put in a bottle, powdered soap, 1 oz.; arsenite of potassa, 4 dr.; sulphate of alumina, 4 dr.; pulverized camphor, 4 dr.; alcohol, 12 oz. Let

### (Oxgall Soap)

the mixture stand 24 hours, then add 6 drops of oil of thyme, and cork the bottle carefully.

7.—Parts by weight: Pulverized arsenious acid, 32; dried carbonate of potash, 12; distilled water, 32; Marseilles mottled soap, 32; powdered quicklime, 40; refined camphor, 10. The arsenious acid and the carbonate are dissolved in the distilled water, and the mixture is brought to the boil; the soap is added, cut into as fine shreds as possible, and the mass is taken off the fire. After complete solution the quicklime and the camphor are added, the latter being pulverized with the aid of alcohol. Finally, the mixture is ground up thoroughly.

**Oatmeal Soap.**—White soap, 25 lb.; half palm soap, 10 lb.; cocoanut-oil soap,  $6\frac{1}{2}$  lb.; oatmeal (coarse ground), 6 lb.

**Olein Soaps.**—1.—Saponified oleic acid, 150 lb.; tallow, 40 lb.; crude palm oil, 10 lb.

2.—Saponified oleic acid, 155 lb.; crude palm oil, 10 lb.; cotton-seed oil, 20 lb.; linseed oil, 15 lb.

**Orange-Flower Soap.**—White curd soap, 60 lb.; palm-oil soap, 40 lb. Color with yellow-green pigment, 16 oz.; minium (red lead),  $2\frac{1}{2}$  oz. Perfume with oil of Portugal, 15 oz.; oil of ambergris, 15 oz. Mix as soap à la rose. Very fine.

**Oxgall Soap.**—1.—To wash fine silk stuffs, such as piece goods, ribbons, etc., one cannot do better than employ a soap containing a certain amount of oxgall. Heat 1 lb. of cocoanut oil to 30° R. (100° F.) in a copper kettle. While stirring vigorously add  $\frac{1}{2}$  lb. of caustic soda lye of 30° R. In a separate vessel heat  $\frac{1}{2}$  lb. of white Venice turpentine, and stir this in the soap in the copper kettle. Cover the kettle well, and let it stand, mildly warmed, for 4 hours, when the temperature can be again raised until the mass is right hot and flows clear; then add 1 lb. of oxgall to it. Now pulverize some good, perfectly dry grain soap, and stir in as much of it as will make the contents of the copper kettle so hard that it will give little to the pressure of the fingers. From 1 to 2 lb. is all the grain soap required for the above quantity of gall soap. When cooled, cut out the soap and shape into bars. This is an indispensable adjunct to the dyer and cleaner, as it will not injure the most delicate color.

2.—Purified oxgall, 1 part; white curd soap, 2 parts. The soap is cut into shavings, and melted in the oxgall at a moderate heat, evaporating until of the proper

## Soaps and Candles

### (Soap Paste)

consistency. The oxgall is prepared by boiling it with 10 to 12 parts of wood spirit, and straining.

3.—Extract of quillaja bark, 50 parts; borax, 50 parts; fresh oxgall, 20 parts; soap, 75 parts.

4.—Parts by weight: Coconut oil, 50; ultramarine, 0.1; caustic soda lye, 40° B., 20; solution of carbonate of potash, 10° B., 4; oxgall, 3; bichromate of potash, 0.05; sea salt solution, 15° B., 2.5; ammonia liquid, 2.5; turpentine, 2.5. After having saponified the oil, colored with the ultramarine, the carbonate of potash is added with the oxgall, then the bichromate with the sea salt. The whole is stirred, then the two last substances are added.

*Palm Soap*.—1.—White tallow, 900 lb.; palm oil, 400 lb.; cocoanut oil, 200 lb.; yellow rosin, 100 lb.; total, 1,600 lb.

2.—Tallow, 700 lb.; palm oil, 300 lb.; cocoanut oil, 200 lb.; cotton-seed oil, 400 lb.; total, 1,600 lb.

3.—Lard, 550 lb.; tallow, 400 lb.; cotton-seed oil, 450 lb.; rosin, 200 lb.; total, 1,600 lb.

4.—Palm oil, 300 lb.; tallow, 200 lb.; rosin, 20 lb.; total, 520 lb.

5.—Tallow, 500 lb.; palm oil, 300 lb.; rosin, 200 lb.; total, 1,000 lb.

6.—Palm oil, 450 lb.; cocoanut oil, 50 lb.; total, 500 lb.

7.—Lard, 550 lb.; palm oil, 150 lb.; cocoanut oil, 50 lb.; clarified rosin, 50 lb.; total, 800 lb.

*Paste*.—1.—Alcoholic Pumice Soap.—Castile soap, 60 grams; pumice, in fine powder, 300 grams; alcohol, enough. Reduce the soap to fine shavings, and dissolve in 300 c.c. of alcohol on a water bath; then add enough alcohol, previously heated, to bring the measure up to 1,000 c.c. The pumice, which should be dried and sterilized, is then added, and the mixture is shaken energetically in a flask until it cools and acquires a thick consistency. It may then be transferred to suitable vessels, capable of being well closed, in which it eventually congeals so as to form a creamy soap. It is important that the mixture be so manipulated that the pumice shall not separate; this may be done by continually shaking the mixture until the paste is thick, but not too thick to pour from the flask in which it is made.

2.—Marble-dust Soap.—Mix common washing soap with three times its volume of marble dust, and knead until a homogeneous mass is obtained.

3.—Oxgall Soap.—Rub together 30 parts each of borax and quillaja extract

### (Petroleum Soap)

(made by exhausting 150 parts of ground bark with boiling water and evaporating to a syrupy consistency), and add 120 parts of fresh oxgall; finely incorporate this mixture with 450 parts of melted soap.

*Patchouly Soap*.—Curd soap, 4½ lb.; otto of patchouly, 1 oz.; otto of santal, ¼ oz.; otto of vitiveri, ¼ oz.

*Petroleum Soap*.—The saponification of petroleum is easily effected through the agency of carnauba wax, or of beeswax, and we believe that soaps carrying as high as 25% of petroleum are now commercially manufactured by processes in which carnauba, beeswax or Japan (myrtle) wax play a prominent part. Petroleum, 5 parts; refined beeswax, 4 parts; 90% alcohol, 5 parts; Castile soap, 10 parts. Put the petroleum in a suitable vessel, along with the wax and alcohol, and cautiously heat in the water bath, with occasional shakings, until complete solution is effected. Add the soap, finely shaved or powdered, and continue the heat until it is dissolved. Remove from the bath, agitate the vessel until the contents begin to "set," then pour into molds.

*Powdered Soaps*.—1.—All hard soaps may be reduced to a fine powder, when perfectly dry, by trituration with a pestle and mortar, but the operation is generally confined to cosmetic soaps for shaving or other toilet purposes. The soap, being previously perfumed in the usual way, is cut into thin shavings, and these are laid upon sheets of paper and placed in the drying-room, or dried in any convenient way. As soon as the shavings become brittle they are in a condition for powdering. Small quantities at a time should be carefully reduced to a powder in a mortar, and the powder afterward passed through a fine sieve, the fine powder being placed in a jar and kept well covered. All coarser particles retained by the sieve should then be pulverized and sifted as before, until the entire quantity is reduced to a powder fine enough to pass through the sieve.

2.—Powdered Marseilles soap, 10 kgm.; bran of almonds, 500 grams; lavender oil, 50 grams; thyme oil, 30 grams; spike oil, 20 grams; citronella oil, 20 grams.

3.—Almond paste, and other like cosmetic powders, often receive this name. The product of the following formula is also much esteemed among the higher classes: Almond powder, 1 lb.; powdered cuttlefish bone, 5 oz.; curd soap, air-dried, and powdered, 2½ oz.; white Castile soap, air-dried, and powdered, 2½ oz.; orris

## Soaps and Candles

### (Rice Soap)

root, in fine powder,  $1\frac{1}{2}$  oz. Mix, and pass the whole through a fine sieve. Used to clean, soften and whiten the hands, and to prevent chaps and chilblains.

4.—Yellow soap, 6 parts; soda crystals, 3 parts; pearlash,  $1\frac{1}{2}$  parts; sodium sulphate,  $1\frac{1}{2}$  parts; bleached palm oil, 1 part. These ingredients are mixed as well as possible without any water, spread out to dry, and then ground into coarse powder. The palm oil imparts an agreeable odor.

5.—Powdered curd soap, 4 parts; sal soda (crude sodium carbonate), 3 parts; sodium silicate, 2 parts. Dried as much as possible, and intimately mixed.

**Pumice-Stone Soaps.**—These soaps are always produced by the cold process, either from coconut oil alone, or in conjunction with tallow, cotton oil, bleached palm oil, etc. The oil is melted and the lye stirred in at  $32$  to  $35^{\circ}$  C.; next, the powdered pumice stone is sifted into the soap, and the latter is scented.

1.—The following process is for making a hard soap, carrying pumice and alcohol, and to be used in cleaning and disinfection of the hands, etc.: Almond-oil soap, shaved thin, 60 to 70 parts; 96% alcohol, 300 parts. Heat together in the water bath until the soap is dissolved (a back-flow cooling apparatus should be used in this operation). As soon as dissolved, add sufficient hot alcohol, of the same strength, to make 1,000 parts. Now add 300 parts of sterilized dry pumice-stone powder, stirring energetically all the time. The whole may now be left to cool off slowly, but it is better to keep up an agitation of the mass until solidification sets in. Too much agitation, however, causes the preparation to take the shape of a "cream." It should be kept in airtight containers.

2.—Pumice-stone soap is got by dissolving coconut-oil soap in a small quantity of water and running it into molds. Half its weight of powdered pumice stone is added, and the whole is stirred until it sets.

3.—Ceylon coconut oil, 2 lb.; soda lye of  $40^{\circ}$  B., 1 lb.; pulverized pumice stone,  $1\frac{1}{4}$  lb. Perfume with oil of thyme,  $\frac{1}{4}$  oz.; oil of bergamot, 1 dr.

4.—Coconut oil, 40 kgm.; cotton oil, 10 kgm.; caustic soda lye,  $38^{\circ}$  B., 24 kgm.; caustic potash lye,  $30^{\circ}$  B., 1 kgm.; powdered pumice stone, 25 kgm.; cassia oil, 150 grams; rosemary oil, 100 grams; lavender oil, 50 grams; safrol, 50 grams; clove oil, 10 grams.

**Rice Soap.**—Wax soap, 1,350 parts; starch, 200 parts; oil of geranium,  $1\frac{1}{2}$

### (Salol Soap)

parts; essence of Portugal,  $2\frac{1}{2}$  parts; oil of bergamot,  $2\frac{1}{2}$  parts; essence of mirbane,  $1\frac{1}{2}$  parts; tincture of benzoin, colored white or red,  $\frac{1}{4}$  part; cinnabar, 4 parts.

**Rose Soap.**—1.—White soap, 25 lb.; coconut oil, 25 lb.; French vermilion, 6 oz. Perfume with oil of bergamot, 2 oz.; oil of cinnamon,  $\frac{1}{2}$  oz.; oil of rose,  $1\frac{1}{2}$  oz.; oil of cloves,  $\frac{1}{2}$  oz.; oil of neroli,  $\frac{1}{2}$  oz.

2.—New olive-oil soap, 30 lb.; new tallow soap, 20 lb.; reduce them to shavings by sliding the bars along the face of an inverted plane, melt in an untinned copper pan by the heat of steam or a water bath, add  $1\frac{1}{2}$  oz. of finely ground vermilion, mix well, remove the heat, and when the mass has cooled a little add essence of roses (otto?), 3 oz.; do. of cloves and cinnamon, of each 1 oz.; bergamot,  $2\frac{1}{2}$  oz.; mix well, run the liquid mass through a tammy cloth, and put it into the frames. If the soaps employed are not new, 1 or 2 qt. of water must be added to make them melt easily. Very fine.

**Rosin Soap (Altenburg).**—Rosin, 225 lb.; coconut oil, 225 lb.; soda lye,  $28^{\circ}$ ,  $371\frac{1}{4}$  lb. Use the cold process, and before putting in the frames cut with a salt lye of  $24^{\circ}$  B.

**Salol.**—The soap is prepared in two stages, the first being the manufacture of the base. This is carried out as follows: One pound of beef suet is melted with  $\frac{1}{2}$  lb. of coconut oil, and allowed to cool to  $120^{\circ}$  F.; then 14 oz., by weight, of 18% caustic soda solution and  $2\frac{1}{2}$  oz. of 24% caustic potash solution are added and stirred together at a gentle heat for half an hour, or until a homogeneous mixture is formed. Perfume is now added, consisting of oil of caraway, 40 minims; oil of bergamot, 50 minims; oil of lavender, 30 minims; oil of thyme, 20 minims; essence of mirbane, 6 drops. While the mass is still warm, 1 oz. of finely powdered salol is added, the whole heated sufficiently to melt the antiseptic (to  $113^{\circ}$  F.), and well stirred. It is then allowed to cool, cut into pieces of the desired size, dried partially in the air, and wrapped in tinfoil. The salol soap powder is made by mixing 35 oz. of finely powdered stearine soap with 1 gr. of coumarin, 5 drops of oil of bergamot and 2 drops of oil of wintergreen; 2 lb. of this base are mixed with 1 oz. of finely powdered salol.

**Sand Soap.**—1.—Coco oil, 24 kgm.; soda lye,  $38^{\circ}$ , 12 kgm.; finely sifted sand, 28 kgm.; cassia oil, 100 grams; saffrafras oil, 100 grams.

## Soaps and Candles

### (Soft Soap)

2.—**Sand Balls.**—These are prepared by adding to the melted soap about half its weight of fine siliceous sand. Sifted Calais sand is usually employed. Some persons prefer the shelly sea sand (sifted from the shells, and well washed) for the purpose. For the finer qualities, finely powdered pumice stone is now usually employed. Used to prevent roughness and thickening of the skin in cold weather; also to clean the hands when dirty. The best yellow soap, with or without the addition of one-third of its weight of white soft soap, and a little sweet oil, is the best for these balls.

**Sapolio.**—Sapolio contains, besides organic matter, soda, iron, alumina, lime and hydrochloric, sulphuric, carbonic and silicic acids.

**Scouring Balls.**—White curd soap, 35 lb. 2 oz.; pearlash, 6 lb. 6 oz.; oil of juniper, 3 lb. 3 oz. Mix together, having previously added a little water to the soap and pearlash to dissolve them by a moderate heat; add the oil of juniper, and mold into balls.

**Scouring Soap.**—1.—Dissolve in alcohol  $9\frac{1}{2}$  oz. of Castile soap; add the yolks of 8 eggs and 8 fl. dr. of oil of turpentine.

2.—**Wine and Vinegar Stains.**—White soap, 5 oz.; oil of turpentine, 2 fl. dr.; ammonium chloride, 50 gr. Mix.

**Shaving Soaps and Creams.**—The formulas for shaving soaps and creams have been more appropriately classified under TOILET PREPARATIONS. See that chapter. Reference to the Index will give page number.

**Soft Soap.**—1.—Domestic. — Potash,  $7\frac{1}{2}$  lb.; grease, 10 lb.; water,  $37\frac{1}{2}$  gal. Dissolve the potash in part of the water, add one-third of the grease, and heat. Mix in the remainder of the grease, put in a barrel, and add the remainder of the water, a little at a time, for several days. Stir often. Ready for use in about 2 weeks.

2.—**Hardening.**—Put into a kettle 4 paulfuls of soft soap, and stir in it, by degrees, about 1 qt. of common salt. Boil until all the water is separated from the curd, remove the fire from the kettle and draw off the water with a siphon (a yard or so of india-rubber hose will answer). Then pour the soap into a wooden form in which muslin has been placed. For this purpose a wooden box, sufficiently large, and tight, may be employed. When the soap is firm turn it out to dry, cut into bars with a brass wire, and let it harden. A little powdered rosin will assist the soap to harden and give it a yellow

### (Tannin Soap)

low color. If the soft soap is very thin, more salt must be used.

3.—**Soft Soap with Potash.**—To 20 lb. of clear grease take 17 lb. of pure white potash. Buy the potash in as fine lumps as it can be procured, and place it in the bottom of the soap barrel, which must be watertight, and strongly hooped. Boil the grease, and pour it, boiling hot, upon the potash; then add 2 Shaker paulfuls of boiling hot water; dissolve 1 lb. of borax in 2 qt. of boiling hot water, and stir all together thoroughly. Next morning add 2 paulfuls of cold water, and stir for  $\frac{1}{2}$  hour; continue this process until a barrel containing 30 gal. is filled up. In a week, and even less, it will be fit for use. The borax can be turned into the grease while boiling, and also 1 lb. of rosin. Soap made in this manner always comes, and is a first-rate article, and will last twice as long as that bought at the soap chandler's. The grease must be tried out, free from scraps, ham rinds, bones, or any other debris; then the soap will be as thick as jelly, and almost as clear.

4.—**Shaker Soft Soap.**—Grease,  $4\frac{1}{2}$  qt.; strong lye, made from wood ashes, 18 gal.; water, q. s. to make up to 45 gal.

**Spermaceti Soap.**—Curd soap, 14 lb.; otto of bergamot,  $2\frac{1}{2}$  lb.; otto of lemon,  $\frac{1}{2}$  lb.

**Surgical Soap Solution.**—1.—Terrier employs the following liquid soap for general washing of patients: White Castile soap, 1 kgm.; soft soap, 1 kgm.; olive oil, 1 kgm.; water, 50 l.; naphthol, 25 grams; lemon oil, q. s. to perfume. Heat the soap and oils together in the water for 24 hours at least, then add the naphthol, and filter.

2.—Richaud recommends the following liquid soap for the use of surgeons in washing their hands, as yielding a product more foamy, and penetrating the pores of the skin more readily, than the soaps ordinarily used: White soap, 1,000 grams; soft soap, 1,000 grams; poppy oil, 500 grams; water, 3 l. The white soap, previously rasped, is added to the other constituents, and the whole is warmed until a homogeneous mass is obtained. There is now added a mixture of the following composition: Glycerine, 50 grams; beta-naphthol, 50 grams; alcohol, 500 grams; oil of lemon, 50 grams; water enough to make 15 l. of finished product.

**Tannin Soap.**—1.—Dissolve 30 lb. of tallow soap; add 2 lb. of tannic acid, and enough starch to form the mass into cakes.

## Soaps and Candles

### (Transparent Soap)

2.—Cocoanut oil, 9 kgm., saponified with  $4\frac{1}{2}$  kgm. of soda lye; then 250 grams of tannin, previously dissolved in alcohol, are put in, and the whole mixed. The soap is perfumed with 30 grams of Peru balsam, 10 grams of cassia oil and 10 grams of oil of cloves.

*Tar Soap, Liquid.*—1.—Parts by weight: Cocoanut oil, 100; beech-tree tar, 15; soapmakers' lye, 60.

2.—Tar, 1 part; liquor potassæ, 2 parts; soap, in shavings, 2 parts. Beat them together till they unite. Action stimulant, in psoriasis, lepra, etc.

3.—Soft soap, 30 grams; glycerine, 20 grams; liquor carbon, deterg., 5 grams. Digest these on the water bath until the alcohol is entirely evaporated. When cold, mix with oil of melissa, 6 drops; oil of geranium, 3 drops. Set aside, and filter in a hot-water funnel.

4.—Medicated Tar Soap.—Cocoanut oil, 20 lb.; tallow, 10 lb.; juniper tar, 5 lb.; soda lye, 40° B., 15 lb.

5.—Wood-Tar Soap.—Wood tar, 40 parts; ivory soap, 60 parts; alcohol, 60 parts; water, 40 parts. Shave the soap fine and put it with the water, over the fire. When melted thoroughly add the tar, and stir till it is evenly distributed throughout the mass. Remove from the fire, and let cool down, stirring all the time. When at about 140° F. add the alcohol, and stir in. Pour into tin boxes, and let cool and solidify.

*Terebene Soap.*—Mr. Cleaver combines with soap, while in a melted state, the substance known as terebene, whereby a disinfectant and antiseptic soap is produced. This substance is also combined with toilet creams, cosmetics, etc. The following proportions, which may, however, be varied at will, are said to give good results: For toilet soap,  $4\frac{1}{2}$  pt. of terebene are added to 112 lb. of soap. For household or laundry soap, he adds 6 pt. of terebene to 112 lb. of soap. The terebene is introduced into the soap in its liquid state, and thoroughly incorporated by stirring. The soap may be perfumed, if desirable. The soap is known as terebene soap.

*Transparent Toilet Soaps.*—The best grades, as a rule, are made by what is called the "alcohol process," which consists in dissolving ordinary good, opaque soap, made from tallow, lard, and other fats and oils, in boiling alcohol, and subsequently evaporating the solvent, leaving the soap in a more or less transparent condition. By this process, any carbonate of the alkali, sulphate of sodium, and other impurities present in the origi-

### (Transparent Soap)

nal soap, are entirely eliminated in the finished product, as these substances are insoluble in strong alcohol. In manufacturing transparent soaps, the solution of soap, which is first reduced to shavings, and dried as completely as possible, is effected in a closed vessel resembling a still, and when all of the soap has dissolved the solution is placed in another still, from which the alcohol is distilled off and condensed, ready for further use, after which the residue of hot soap is withdrawn and placed in suitable frames to set. After cutting the soap, which is usually muddy looking, and far from clear, it is exposed for some time to warm air, to evaporate remaining traces of alcohol and of alcohol and water, during which time it becomes clear and transparent. By long keeping, and exposure to air, the soap darkens in color, acquiring a rich amber tint. The addition of glycerine materially improves the soap, by giving a more transparent product, besides imparting a pleasant emollient feel in use. Sugar and rosin also have the property of increasing the transparency of soap. Various qualities of transparent soap are made by the alcohol process, resulting from the presence or absence of the above and other substances, and also from the substitution of methylated spirit for alcohol. A large amount of low-priced transparent soap is made by the so-called "cold process," from castor oil, tallow, cocoanut, palm and other oils. To make the soap, the fats and oils are melted at a low temperature (180 to 190° F.), in a jacketed pan, provided with revolving crutching arms or mixers, and the exact quantity of caustic soda solution of about 1.30 sp. gr., required to completely saponify the oils, is vigorously mixed in. The pan is then covered and left at rest for some time, during which the temperature rises considerably, and the saponification is supposed to be completed. A quantity of sugar, dissolved in hot water, is then stirred into the soap, and some crystals of sodium carbonate also added. Alcohol is then put in to clear the liquid and cause the "fob" to rise to the surface, while the pan again remains covered and at rest for some time, after which the fob is skimmed, and the clear, thin soap ladled into the frames, where the perfumes are added, and it is allowed to set. After 2 days it is cut into bars and tablet pieces, and the cakes stamped, packed, etc. It is a question whether these soaps can be advantageously made upon the small scale or not. Special apparatus and technical knowl-

## Soaps and Candles

### (Transparent Soap)

edge and experience are absolutely necessary in the production of a desirable article. We append several formulas which may be of service, the first one of which contains no glycerine, and is made by the "cold process."

1.—Cocoanut oil, 35 parts; talc, 10 parts; castor oil, 5 parts; caustic soda lye, 37° B., 25 parts; caustic soda lye, 20° B., 15 parts; potash, 90%, 50 parts; sodium chloride, 8 parts; calcium chloride, 7 parts; boiling water, 150 parts. Dissolve the potash, salt and calcium chloride in the hot water, and dilute the solution until it shows a dilution of 10° B. Mix the oils, talc and lyes, and saponify by agitation. As soon as this occurs, mix the solution first made, with constant stirring, and add perfume to taste. Pour the soap into forms, and let it stand uncovered for 1 hour, then cover closely. For perfume, use 120 parts of oil of citronella, 80 parts of oil of bergamot, and 10 parts of tincture of musk.

2.—A process which contains glycerine, but uses no alcohol: Cocoanut oil, 26 oz.; suet, 30 oz.; castor oil, 37½ oz.; heated together, and allowed to reach finally a temperature of 156° F.; to this mixture is then added 56 oz. of a 30% caustic soda solution at a temperature of 66° F. When the mass has become quite stiff it is heated in a water bath at a temperature of 180 to 190° F., until completely saponified, and a clear, transparent product results: 25 oz. of sugar and 3 oz. of glycerine, dissolved in 26 oz. of water, strained, and warmed to 190° F., is gradually stirred into the mixture; 10 oz. of freshly powdered sodium carbonate is then stirred into the mixture until it is thoroughly dissolved, when a sample of the resultant compound spread upon glass should become hard. The rest of the mixture is allowed to remain in the water bath for about 2 hours, when a sample cupful should remain firm, clear and transparent. This last can be insured, if necessary, by adding 1 to 2 oz. of sodium carbonate and warming the mixture to 145° F.; when cooled, to 135° F. Several precautions are necessary in order to avoid the flocculent or turbid appearance of the product, namely, to use purified fats of the best quality, pure glycerine, and water free from lime.

3.—Best tallow, 10 kgm.; best olive oil, 2 kgm.; best cocoanut oil, 4 kgm.; solution caustic soda, 38° B., 6½ kgm.; solution caustic potash, 38° B., 6½ kgm.; distilled water, 1 kgm.; glycerine (C. P.), 28° B., 8 kgm.; alcohol, 6½ kgm.; water, 1¼ kgm. Perfume with oil of bergamot,

### (Vaseline Soap)

300 grams; oil of geranium, 50 grams; oil of sandalwood, 10 grams; oil of Ceylon cinnamon, 20 grams; oil of cloves, 20 grams; oil of petit-grain (French), 50 grams; oil of lavender, 50 grams; 94% alcohol, 600 grams. Melt the fats, and strain; heat to 75° C., add the glycerine and the aqueous solution of the alkalies in a thin stream. Heat and stir until saponification takes place. Cool the mixture to 80° C., then add the alcohol, previously mixed with the water; this will redissolve the mass. Finally, add the perfume, pour into molds, and let cool.

4.—Animal fat, 450 parts; cocoanut oil, 50 parts; caustic soda, 36° B., 250 parts; common salt, 100 parts; vaseline, 150 parts; distilled water, 1,000 parts. Dissolve in the water bath, the fat and oil in the soda lye, add the salt and vaseline, and finally the water. Color and perfume to taste.

**Turpentine Soap.**—As a rule, the soap is boiled from palm-kernel oil and some tallow, with 20% of rosin, saponified with lye of 25% and run to clear paste. To 100 parts of the charge, use 5 to 6% of black tar, such as may be obtained in stearine factories, from the distillation, and boil it with it. After it has been boiled for a time salt it out with strong lye or salt. The lye is then removed, the grain washed out with hot water so that the soap will be transparent and run into the mold. To each 100 parts, 2 to 3 parts of oil of turpentine are added, and stirred cold, and finally filled with water glass, or the charge is boiled as in the Eschweg (mottled soap) process and the soap run into the mold. Then the oil of turpentine is added, the soap crutched cold, and, if desired, filled with water glass. The soap thus produced has an agreeable tar odor or a turpentine smell, is usually pressed, and is of dark color, approaching black.

**Vanilla Soap.**—1.—White tallow soap, 10 kgm.; perfume with tincture of vanilla, 500 grams; oil of roses, 5 grams. Color with 100 grams of burnt sienna.

2.—Lard, with vanilla, 30 lb.; cocoa butter, 10 lb.; palm oil, 10 lb.; caustic lye, 36° B., 26 lb.; wax, 2 lb.; starch, 2 lb. Perfume with tincture of vanilla, 4 oz.; tincture of musk, 2 oz.; tincture of ambergris, 2 oz.; oil of rose, ¼ oz. Lard with vanilla is prepared by adding the vanilla to the lard, 1 oz. to the lb., keeping it at a moderate heat for some days, then straining, etc.

**Vaseline Soap.**—1.—Cocoanut oil, 160 parts; vaseline, 20 parts; lye of 40° B., 76 parts; water, 4 parts.

## Soaps and Candles

### (White Soap)

2.—Melt slowly, cocoanut oil, by weight, 10 parts; vaseline, by weight, 2 parts; add 50 grams of soapmakers' lye. When the mass is quite clear, run into molds and perfume.

3.—Vaseline Tar Soap.—Saponify 40 lb. of cocoanut oil and 6 lb. of tar with 22 lb. of lye, 40° B. Dissolve 4 lb. of yellow vaseline, and stir in the soap, with 1 lb. of lukewarm water.

*Vegetable Soap, by Delteil, Paris.*—Farina of pistachio nuts, 3 parts; beech nuts, 1 part; buckwheat meal, orris and patchouli, 1 part. The perfume of the product can be varied. It may be either essence of rose, almonds, bergamot, or musk.

*Violet Soap.*—Yellow.—Yellow cocoanut oil, 20 lb.; palm oil, 20 lb.; tallow, 10 lb.; soda lye at 36° B., 26 lb.; powdered orris root, 4 lb. To which are added the following perfumes: Oil of lemon, 4 oz.; oil of rhodium, 2 oz.; oil of thyme, 2 oz.; tincture of musk, 4 oz. Color with cadmium yellow.

*Washballs or Savonnettes.*—These may be made of any of the milder toilet soaps or from the subjoined formulae. The spherical form is given by pressing the soap in molds, or by first forming them into balls with the hand, and, when quite dry and hard, turning them in a lathe. The paste may be formed into balls by hand, and, when quite dry, finished by turning them on a lathe. They may be polished by rubbing with a cloth wet with a little spirit.

1.—Curd soap, in shavings, 3 lb.; finest yellow soap, in shavings, 2 lb.; soft water,  $\frac{3}{4}$  pt. Melt by gentle heat, and stir in powdered starch,  $1\frac{1}{2}$  lb. When the mass has considerably cooled, add essence of lemon or bergamot,  $1\frac{1}{2}$  oz., and make into balls.

2.—Savonnettes of Camphor.—White curd soap, 3 lb. Melt, with the addition of a little water, and then add spermaceti, 4 oz.; camphor, cut small, 2 oz. These are first to be melted together, and then added to the liquid soap.

3.—Camphor.—Melt spermaceti, 2 oz.; add camphor, cut small, 1 oz.; dissolve, and add the mixture to white curd soap,  $1\frac{1}{2}$  lb., previously melted by the aid of a little water and gentle heat, and allowed to cool considerably. These balls should be covered with tinfoil.

*White Soap.*—Put into a pan capable of holding about 100 gal., tallow, lard or bleached palm oil, 120 lb.; cocoanut oil, 40 lb.; apply gentle heat, with occasional stirring, until all the fatty matter is melted. When the liquid grease has attained

### (Wool-Washing Compound)

the heat of about 120° F., add, gradually, 80 lb. of lye at 36° B., and stir well until a complete union of the fatty matters and alkali is effected. The temperature of the ingredients at the time of adding the alkali must not be higher than 122° F.; otherwise there will be a separation of the lye from the fatty materials. If the stirring has been diligently pursued, the saponification will be complete in about 2 hours, and the soap is then ready for the frame. If it is desired to perfume the soap, this should be done while it is in the pan, and before it has had time to cool. It is not a good plan, when making small quantities of soap, to add the perfume after the soap is in the frame, since it is then more difficult to effect a perfect incorporation of the respective materials.

*Windsor Soap.*—The best Windsor soap is made of a mixture of olive oil, 1 part, and ox tallow or suet, 9 parts, saponified by caustic soda; but most of the Windsor soaps of the shops are merely ordinary curd soap, scented. On the large scale, the perfume is added while the soap is in the soft state, just before it is put into the frames, but on the small scale it may be prepared in the same way as soap à la rose.

1.—Best beef tallow and oil soap, as above, 3 cwt.; essence of caraway, 2 lb.; English oil of lavender,  $\frac{1}{2}$  lb.; oil of rosemary,  $\frac{1}{2}$  lb.; mix as soap à la rose.

2.—Hard curd soap, 1 cwt.; oil of caraway,  $1\frac{1}{2}$  lb.; tincture of musk, 12 oz.; English oil of lavender, 2 oz.; oil of origanum,  $\frac{1}{2}$  oz.; as last.

3.—Curd soap, melted, and scented with the oils of caraway and bergamot. Brown Windsor soap is the same, colored.

4.—This famous toilet soap, as prepared in London, is generally made from tallow, 9 parts, and olive oil, 1 part, and is perfumed, for every 1,000 lb. of the paste, with oil of caraway, 6 lb.; oil of lavender,  $1\frac{1}{2}$  lb.; oil of rosemary,  $1\frac{1}{2}$  lb.

*Witch Hazel Soap.*—The juice of the plant, *Hamamelis virginica*, or common witch hazel, is mixed with soap, and the various compounds for toilet purposes which contain soap, and it is said that such compounds are beneficial in cases of bruises and lacerations of the skin.

*Wool-Washing Compound.*—1.—This is a mixture composed of dried soda, 35 parts; powdered soap, 10 parts; sal ammoniac, 10 parts.

2.—A good soap for freeing wool of grease can best be prepared from olive and Cochlin cocoanut oils. Olive oil, 1,760

## Soaps and Candles

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### (Wool-Washing Compound)

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lb., are boiled to a grain with caustic soda lye. After the soap has separated, and the lye has been drawn off, 1,000 lb. of potash solution of 20° B. are added, and allowed to boil a little. Now 440 lb. of Cochin oil are added, and, when well taken up, the same quantity of potash solution of 20° B. is gradually added as the soap can take it up. Then place in tinned forms of about 220 lb. capacity.

3.—A cheap and less valuable article, such as is frequently used for cleaning ordinary wool, is also easy to prepare. Elaine, 1,760 lb., and tallow, 440 lb., are boiled to a grain, the precise method of boiling being immaterial, provided one obtains a good firm grain. In another kettle a soda solution is prepared of 30° B. Now take 220 lb. of this soda solu-

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### (Yellow Soap)

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tion, place it in a shallow kettle with 440 lb. of the grain soap, stir well, and then add, with constant stirring, 220 lb. of dry soda. In this way a thick paste is obtained, which is allowed to cool in the pan, and is removed, after 48 hours, with a chisel. This is broken up into small pieces of the size of an egg, and packed in barrels for shipment.

*Yellow Soap.*—Tallow, 1½ lb.; sal soda, 1½ lb.; rosin, 56 lb.; stone lime, 28 lb.; palm oil, 8 oz.; soft water, 28 gal. Put soda, lime and water into a kettle, and boil, stirring well; then let it settle, and pour off the lye. In another kettle melt the tallow, rosin and palm oil, having it hot, the lye being also boiling hot. Mix all together, stirring well, and the work is done.





## CHAPTER XXIV

### SOLDERS AND SOLDERING

#### GENERAL SCHEME OF CLASSIFICATION

SOLDERING FLUIDS, FATS,  
PASTES AND POWDERS  
HINTS ON SOLDERING  
TABLE OF SOLDERS  
DETAILED FORMULAS FOR SOLDERS  
CLASSIFICATION OF SOLDERS  
SOFT SOLDERS  
HARD SOLDERS

DETAILED FORMULAS FOR SOLDERS (*Continued*)  
GERMAN SILVER SOLDERS  
SILVER SOLDERS  
GOLD SOLDERS  
ALUMINUM SOLDERS  
MISCELLANEOUS FORMULAS FOR SOLDERS FOR SPECIAL PURPOSES

#### SOLDERING FLUIDS, FATS, PASTES AND POWDERS

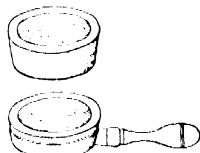
*The Soldering of Metals and the Preparation of Solders and Soldering Agents.*—

The object of soldering is to unite two portions of the same metal or of different metals by means of a more fusible metal or metallic alloy, applied when melted, and known by the name of solder. As the strength of the soldering depends on the nature of the solder used, the degree of strength required for the joint must be kept in view in choosing a solder. The parts to be joined must be free from oxide and thoroughly clean; this can be secured by filing, scouring, scraping, or pickling with acids. The edges must exactly fit, and be heated to the melting-point of the solder. The latter must have a lower melting-point than either of the portions of metal that require to be joined, and if possible only those metals should be chosen for solder which form alloys with them. The solder should also as far as possible have the same color and approximately the same strength as the article whose edges are to be united.

To remove the layers of oxide which form during the process of soldering, various so-called "fluxes" are employed. These fluxes are melted and applied to the joint, and act partly to keep off the air, thus preventing oxidation, and partly reduce and dissolve the oxides themselves. The choice of a flux depends on the quantity of heat required for soldering.

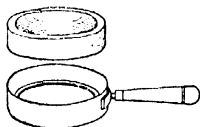
Solders are classed as soft and hard solders. Soft solders, also called tin solders, or white solders, consist of soft, readily fusible metals or alloys, and do not possess much strength; they are easy to

handle on account of their great fusibility. Tin, lead-tin and alloys of tin, lead, and bismuth are used for soft solder, pure tin being employed only for articles made of the same metal (pure tin).



Carbon Soldering Block and Holder

The addition of some lead makes the solder less fusible but cheaper, while that of bismuth lowers the melting-point. Soft solders are used for soldering easily fusible metals such as Britannia metal, etc., also



Asbestos Soldering Block

for soldering tin-plate. To prepare solder, the metals are melted together in a graphite crucible at as low a temperature as possible, well stirred with an iron rod, and cast into ingots in an iron mold. To melt the solder when required for soldering, the soldering iron is used; the lat-

Always consult the index when using this book.

## Solders and Soldering

### (Soldering Fluids)

ter should be kept as free from oxidation as possible, and the part applied should be tinned over.

The fluxes generally used in the soft-soldering of metals are powdered rosin or a solution of chloride of zinc, alone or combined with sal ammoniac.

**Soldering Fluids, Antacid.**—1.—A neutral soldering liquid can be prepared by mixing 27 parts neutral zinc chloride, 11 parts sal ammoniac and 62 parts water, or 1 part sugar of milk, 1 part glycerine, and 8 parts water.

2.—Into an earthenware cup pour some commercial muriatic acid, into which put small pieces of scrap zinc. Let one piece dissolve or nearly so before another is put in, as otherwise the acid gets very hot, and is liable to break the jar. Always put more in than the acid will dissolve. Then let it stand for twenty-four hours. Now pour half of this into a small bottle with a wide mouth, and dilute with an equal volume of water, and filter. Add liquid ammonia by the drop until the precipitate formed in the beginning dis-



Asbestos Soldering Cone

solves again. Apply with a stick or small brush. Use what remains in the jar to clean the iron after each heating, by dipping the whole pointed end thereof into the liquid. This flux may be used on almost any metal except aluminum, zinc or galvanized iron. For the two last named the commercial acid should be used, for galvanized iron wire use 3 parts lead and 1 part zinc.

If the shape of the article to be soldered does not admit of the use of liquid soldering water, mix the solution of ammoniac-zinc chloride with starch until a syrupy liquid is obtained.

3.—"Miller soldering liquid," so-called, is prepared by mixing 1 part of a solution of phosphoric acid with 1 to 1½ parts of 80% alcohol.

4.—If the above are not within the reach of the user, a serviceable soldering liquid may be formed by mixing together 1 part of lactic acid, 1 part glycerine, and 8 parts water.

5.—Jewelers' Soldering Fluid.—Add to alcohol as much chloride of zinc as it will dissolve. A good soft solder for repairing

### (Soldering Powders)

is prepared from equal quantities of tin and lead from tea boxes.

6.—Silver, Anti-oxidizer for.—A wash of a paste of whiting and water dried on the bright parts of jewelry or silverware will save it from oxidation while soldering, but must not interfere with the boxed joint to be soldered.

**Fats.**—Soldering fat or grease is commonly a mixture of rosin and tallow with the addition of a small quantity of sal ammoniac. It is particularly adapted to the soldering of tinned ware, because it is easily wiped off the surface after the joint is made, whereas if rosin were used alone, the scraping away might remove some of the tin and spoil the object.

1.—In a pot of sufficient size and over a slow fire melt together 500 grams of olive oil and 400 grams of tallow; stir in slowly 250 grams of rosin in powder, and let the whole boil up once; let it cool down, and add 125 grams of saturated solution of sal ammoniac, stirring the while. When cold, this preparation will be ready for use.

2.—A soldering fat for tin-plate, preferable to ordinary rosin, as it can be more easily removed after soldering, is prepared as follows: 150 parts beef-tallow, 250 parts rosin, and 150 parts olive oil are melted together in a crucible and well stirred, 50 parts powdered sal ammoniac dissolved in as little water as possible being added.

3.—Soldering fat for iron is composed of 50 parts of olive oil and 50 parts powdered sal ammoniac.

4.—Soldering fat for aluminum is made by melting together equal parts of rosin and tallow, half the quantity of zinc chloride being added to the mixture.

**Paste.**—Mix starch paste with a solution of tin chloride to produce a liquid about the consistency of syrup. This is more readily applied than ordinary soldering liquid.

**Powders.**—1.—Borax is the flux most frequently used for hard soldering. It should be applied to the soldering seam either dry or stirred to a paste with water. When used direct the process is somewhat difficult. The parts must be carefully cleaned each time prior to applying the salt. The salt in contact with the soldering iron forms great bubbles, and easily scales away from the surface of the parts to be soldered. It is advisable to use calcined borax; i.e., borax from which the water of crystallization has been driven out by heat, as it does not become so inflated as ordinary borax. Borax dissolves the metallic oxides forming on the joint.

## Solders and Soldering

(Table of Solders)

To avoid the difficulty mentioned, instead of borax use its component parts, boric acid and sodium carbonate. The heat of the soldering iron acting upon them produces an excellent flux.

2.—Mix equal parts of neutral zinc chloride, free from iron, and powdered sal ammoniac. To use, dissolve 1 part of the salt in 3 or 4 parts of water.

3.—For hard soldering aluminum bronze use a mixture of equal parts of cryolite and barium chloride as a flux.

4.—For hard-soldering copper and copper alloys use finely powdered cryolite, or a mixture of 2 parts powdered cryolite and 1 part phosphoric acid.

(Table of Solders)

5.—For soldering iron with cast iron use a flux composed of equal parts of cast-iron filings and calcined borax. Pulverize this black, glassy mixture, and spread the powder on the seam.

6.—For soldering steel, melt in an earthen vessel 3 parts of borax, 2 parts of colophony, 1 part of carbonate of potash, 1 part powdered hard soap to which 3 parts of pulverized glass and 2 parts of steel filings have been added. Run the melted mass on cold sheet iron. When completely cooled, break in pieces and grind fine. Apply to the surfaces to be joined a few minutes before uniting them.

TABLE OF SOLDERS

Name.	Composition.
Soft, coarse.....	Tin, 1; lead, 2
Soft, fine.....	Tin, 2; lead, 1
Soft, fusible.....	Tin, 2; lead, 1; bis., 1
Pewterer's.....	Tin, 3; lead, 4; bis., 2
Spelter, soft.....	Copper, 1; zinc, 1
Spelter, hard.....	Copper, 2; zinc, 1
Silver, fine.....	Silver, 66.6; copper, 23.4; zinc, 10
Silver, common.....	Silver, 66.6; copper, 30; zinc, 3.4
Silver, for brass and iron.....	Silver, 1; brass, 1
Silver, more fusible.....	Silver, 1; brass, 1; zinc, 1
Gold, for 18 carat gold.....	Gold, 18 carats fine, 66.6
Gold, more fusible.....	Silver, 16.7; copper, 16.7
Platinum.....	Same as above with a trace of zinc Fine gold

Material to be Soldered.	Solder.	Flux.
Tin.....	Soft, coarse or fine	Rosin or zinc, chl.
Lead.....	Soft, coarse	Rosin
Brass, copper, iron and zinc.....	Soft, coarse	Zinc, chl.
Pewter.....	Pewterer's or fusible	Rosin or zinc, chl.
Brass.....	Spelter, soft	Borax
Copper and iron.....	Spelter, soft or hard	Borax
Brass, copper, iron, steel.....	Any silver, S.	Borax
Gold.....	Gold, S.	Borax
Platinum.....	Fine gold	Borax

No.	Name.	Composition.	Flux.	Fluxing point.
1.	Plumbers' coarse solder.....	Tin, 1; lead, 3.....	R	800° F.
2.	Plumbers' sealed solder.....	Tin, 1; lead, 2.....	R	441° F.
3.	Plumbers' fine solder.....	Tin, 1; lead, 2.....	R	370° F.
4.	Tinners' solder.....	Tin, 1½; lead, 1.....	R or Z	334° F.
5.	Tinners' fine solder.....	Tin, 2; lead, 1.....	R or Z	340° F.
6.	Hard solder for copper, brass, iron.....	Copper, 2; zinc, 1.....	B	....
7.	Hard solder for copper, brass, iron.....	Good tough brass, 5; zinc, 1...	B	....
8.	Hard solder for copper, brass, iron, more fusible than 6 or 7.....	Copper, 1; zinc, 1.....	B	....
9.	Hard solder for copper, brass, iron.....	Good tough plate brass.....	B	....
10.	Silver solder for jewelers.....	Silver, 19; copper, 1; brass, 1..	B	....

## Solders and Soldering

(Table of Solders)		(Table of Solders)		
TABLE OF SOLDERS—(Continued)				
No.	Name.	Composition.	Flux.	Fluxing point.
11.	Silver solder for plating.....	Silver, 2; brass, 1.....	B	....
12.	Silver solder for silver, brass, iron..	Silver, 1; brass, 1.....	B	....
13.	Silver solder for steel joints.....	Silver, 19; copper, 1; brass, 1..	B	....
14.	Silver solder, more fusible.....	Silver, 5; brass, 5; zinc, 5.....	B	....
15.	Gold solder.....	Gold, 12; silver, 2; copper, 4....	B	....
16.	Bismuth solder.....	Lead, 4; tin, 4; bismuth, 1.....	R or Z	320° F.
17.	Bismuth solder.....	Lead, 3; tin, 3; bismuth, 1.....	R or Z	310° F.
18.	Bismuth solder.....	Lead, 2; tin, 2; bismuth, 1.....	R or Z	292° F.
19.	Bismuth solder.....	Lead, 2; tin, 1; bismuth, 2.....	R or Z	236° F.
20.	Bismuth solder.....	Lead, 3; tin, 5; bismuth, 3.....	R or Z	202° F.
21.	Pewterers' solder.....	Lead, 4; tin, 3; bismuth, 2.....	R or Z	....

Abbreviations: R, rosin; B, borax; Z, chloride of zinc.

### BRASS SOLDERS

	Copper.	Zinc.	Tin.	Lead.	Color.
Very strong.....	58	42	...	...	Reddish yellow
Strong.....	53	47	...	...	Reddish yellow
Medium.....	50	50	...	...	Reddish yellow
Medium.....	54½	43½	1½	½	Reddish yellow
Easily fusible.....	34	66	...	...	White
Easily fusible.....	44	50	4	2	Gray
White solder.....	57	28	15	...	White

The best solder for platinum is fine gold. The joint is not only very infusible, but it is not easily acted upon by common agents. For German silver joints an excellent solder is composed of equal parts of silver, brass and zinc. The proper flux is borax.

### SOLDERS FOR SPECIAL PURPOSES

Solders.	Gold.	Silver.	Copper.	Tin.	Zinc.	Lead.	Bismuth.	Brass.	Melting point.
Pewterer's.....	..	..	..	2	..	1	2	..	300°
Pewterer's, soft.....	..	..	..	3	..	4	1	..	....
Pewterer's, soft.....	..	..	..	2	..	1	..	..	....
Tinman's.....	..	..	..	1	..	1	..	..	393°
Coarse.....	..	..	..	1	..	3	..	..	500°
Plumber's.....	..	..	..	1	..	2	..	..	475°
Hard spelter.....	..	..	4	..	3	..	..	..	1,869°
Gold.....	6	1	2	..	..	..	..	..	....
For brazing steel.....	..	19	1	..	..	..	..	2	....
Hardest silver.....	..	4	1	..	..	..	..	..	....
Hard silver.....	..	3	..	..	..	..	..	1	....
Soft silver.....	..	2	..	..	..	..	..	1	....
For aluminum.....	..	2	..	2	1	2	..	..	....

### WHITE SOLDERS FOR GOLD WORK

No.	Name.	Fine silver. Parts.	Copper. Parts.	Spelter. Parts.	Fusing point.
1.	Hard solder.....	16	3½	½	1,866° F.
2.	Medium.....	15	4	1	1,843° F.
3.	Easy.....	14	4½	1½	1,818° F.
4.	Common hard.....	12½	6	1½	1,826° F.
5.	Common easy.....	11½	6½	2	1,802° F.

## Solders and Soldering

(Soft Solders)		(Soft Solders)		
COLORED SOLDERS FOR GOLD WORK				
No.	Name.	Fine gold. Parts.	Fine silver. Parts.	Shot copper. Parts.
1.	Best gold solder.....	12½	4½	3
2.	Medium gold solder.....	10	6	4
3.	Common gold solder.....	8½	6½	5

### SILVER SOLDERS

No.	Name.	Fine silver. oz.	Shot copper. dwt.	Brass. dwt. gr.	Zinc. dwt. gr.	Arse- nic. Compo. dwt. dwt. gr.
*1.	Hardest—Silver, solder.....	1	0	5	0	.. .. .
2.	Hard.....	1	0	..	..	.. .. .
3.	Easy.....	1	0	..	10	0 .. .. .
4.	Best hard.....	1	0	4	9	.. .. .
5.	Medium.....	1	0	5	8	.. .. .
6.	Easy.....	1	0	6	12	.. .. .
7.	Common.....	1	0	9	15	.. .. .
8.	Enameling.....	1	0	5	0	.. .. .
*9.	Enameling.....	1	0	10	0	.. .. .
*10.	Filligree.....	0	16	0	12	.. .. .
11.	Quick running.....	1	0	..	..	20 10 0
*12.	Chain.....	1	0	10	0	.. .. .
13.	Easy chain.....	1	0	..	..	2 0 .. .. .
*14.	Common.....	1	0	12	0	.. .. .
15.	Common easy.....	1	0	..	..	3 0 .. .. .
16.	Very common.....	1	0	..	..	.. 1 oz. 1 cz.

\*Silver solders recommended for special work.

### DETAILED FORMULAS FOR SOLDERS

#### Soft Solders.

Soft solder, or tin solder, can be used to solder many different metals, gold, silver, lead, copper, and steel, as well as brass, wrought iron and zinc. Its principal use, however, is in ordinary tin-smith's work, for which tin plate, zinc and sheet brass are the materials most frequently employed. Soft solder can be used for any purpose where the soldered articles need not be heated much above the boiling point of water, so that there is no danger of its melting.

For ordinary tin-smith's work, where the resistance of the solder to acids, etc., is of less importance, it is customary to use mixtures of tin and lead, in varying proportions according to different purposes and according to the required melting point of the solder. Experts have taken much pains to make accurate determinations in this important matter, and the following table gives the fusing point (Centigrade) of a solder containing a given amount of lead to 100 parts of tin:

Lead.	Fusing Point, Deg. C.	Density of the Alloy.
16.5 .....	194	7.927
30 .....	194	7.994
33.3 .....	194	8.109
40 .....	194	8.234
45 .....	187	8.267
50 .....	187	8.408
60 .....	181	8.447
66.6 .....	181	8.726
100 .....	197	8.864
119 .....	197	9.038
125 .....	210	9.270
179 .....	210	9.433
200 .....	235	9.554
233 .....	235	9.640
250 .....	235	9.770
268 .....	243	9.797
300 .....	246	9.939
358 .....	246	10.052
536 .....	270	10.331
715 .....	283	10.595
880 .....	292	10.751
1072 .....	292	10.815

It will be seen that the alloys of tin and lead become denser and less readily fusible as the contents of lead are increased.

## Solders and Soldering

### (Soft Solders)

According to other experiments, the fusing points of the alloys are as given below :

Fusing Point.		
Lead.	Tin.	Deg. C.
207	118	189
207	354	180
207	708	190
621	236	211
1242	118	270

Before the solders really melt, they soften considerably, and the following table gives the softening point of some alloys :

		Softening Point.	Melting Point.
Lead.	Tin.	Deg. C.	Deg. C.
1035	236	185	189
1242	236	189	194 to 195
1449	236	192	198
1656	236	202	208 to 210

#### *Alloys Used Specially for Solders:*

		Fusing Point.
Tin.	Lead.	Deg. C.
1180	4140	240
1180	3105	223
1180	2070	200
1180	1242	181
1180	1035	185
1180	828	190

*Composition of Ordinary Soft Solder.*—Lead, 207; tin, 118.

*Weak Soft Solder.*—Lead, 207; tin, 236.

*Strong Soft Solder.*—Lead, 414; tin, 118.

*Fluid Solder.*—Lead, 621; tin, 590.

Fluid solder is prepared by making the given mixture and letting it stand until partially hardened, when the part which is still fluid is poured off. In using this, it is poured into large seams, and works extremely well. The stiffened part can be used as ordinary solder.

If the alloys are to be made in small quantities, it requires very sensitive scales to weigh the metals accurately. The composition of some varieties of tin solder is given below, in round numbers, with the fusing point of each. They are numbered according to their fluidity, No. 1 being the hardest.

1.—Lead, 2; tin, 1. Fusing point, 240° C.

2.—Lead, 1; tin, 1. Fusing point, 200° C.

3.—Tin, 2 to 2½; lead, 1. Fusing point, 185 to 190° C.

4.—Lead, 10; tin, 177. Fusing point, about 180° C.

### (Hard Solders)

*Bismuth Solder.*—For some purposes even the soft solders of tin and lead are too difficult of fusion, and in this case alloys of tin, lead, and bismuth are employed. This is a most excellent solder, but its use is limited to very special purposes, on account of the expensiveness of bismuth. For ordinary work, also, there is no need of such an extremely low fusing point. (See *Fusible Metals* in chapter on ALLOYS.)

#### *Hard Solders.*

In treating of soft solders, it was shown that the fusing point of these compositions varies considerably. The variations are still greater in the case of hard solders, whose composition is such that they melt only on being brought to strong red heat. Some of them can be melted in the ordinary way, with the aid of a soldering iron, while in the case of others, a special apparatus, such as a bellows, must be employed, or the whole object to be soldered must be strongly heated. The numerous kinds of hard solders, with different fusing points, are made necessary by the difference in the nature of the various metals and metallic compositions which may require soldering.

*Yellow Hard Solders.*—1.—Very Hard.

a.—Appelbaum's Compositions.—1.—Copper, 58; zinc, 42.

b.—Sheet brass, 85.42; zinc, 13.58.

c.—Karmarsch's Composition.—Brass, 7; zinc, 1.

d.—Precht's Composition.—Copper, 53.30; zinc, 43.10; tin, 1.30; lead, 0.30.

2.—The foregoing compositions have the yellow color of brass, are very strong, and require very high temperatures for melting, so that they can be used for copper, steel, and all kinds of iron. The ones next given melt more easily than the first, and are suitable for all kinds of work with brass.

a.—Sheet brass, 81.12; zinc, 18.88.

b.—Copper, 54.08; zinc, 45.29.

c.—Brass, 3 to 4; zinc, 1.

d.—Brass, 78.26; zinc, 17.41; silver, 4.33. This is somewhat expensive on account of the silver, but has the valuable property of being at once tenacious and ductile, and can be worked into wire with hammer or rollers.

3.—Still softer are: a.—Brass, 5; zinc, 2.5.

b.—Brass, 5; zinc, 5.

*Half White.*—1.—Copper, 53.3; zinc, 46.7.

2.—Brass, 12; zinc, 4 to 7; tin, 1.

3.—Brass, 22; zinc, 10; tin, 1.

## Solders and Soldering

### (German Silver Solders)

- 4.—Copper, 44; zinc, 49; tin, 3.20; lead, 1.20.  
 1 (Volk's hard solder) and 4 (Precht's half white) are quite readily fusible.  
*White*.—1.—Brass, 20; zinc, 1; tin, 4.  
 2.—Brass, 11; zinc, 1; tin, 2.  
 3.—Brass, 6; zinc, 4; tin, 10.  
 4.—Copper, 57.44; zinc, 27.98; tin, 14.58.

### Solders Prepared from the Pure Metals.

	Copper.	Zinc.	Tin.	Lead.
Very hard.....	57.94	42.06	.....	.....
Very hard.....	38.33	41.67	.....	.....
Hard.....	50.00	50.00	.....	.....
Soft.....	33.34	66.66	.....	.....
Soft, half white	44.00	49.90	3.30	1.20
Soft, white.....	57.44	27.98	14.58	.....
Soft.....	72.00	18.00	4.00	.....
Soft, Volk's....	53.30	46.70	.....	.....

### Solders of Brass and Zinc.

	Brass.	Zinc.	Tin.
Very hard.....	85.42	12.58	.....
Very hard.....	7.00	1.00	.....
Hard.....	3.00	1.00	.....
Hard.....	4.00	1.00	.....
Soft.....	5.00	2.00	.....
Soft.....	5.00	4.00	.....
Half white.....	12.00	5.00	1.00
Half white.....	44.00	30.00	2.00
White.....	40.00	2.00	8.00
White.....	22.00	2.00	4.00
White.....	18.00	12.00	30.00
Very ductile.....	78.25	17.25	.....
For brazier's work...	81.12	18.88	.....

### Brass Solders.

Yellow, hard...	53.30	43.10	1.30	0.30
Half white, soft	41.00	49.90	3.30	1.20
White.....	57.44	27.98	14.58	.....

### German Silver Solders.

The solders thus classified, as their name implies, are used principally for soldering German silver. This alloy contains nickel and is very hard and white, and it requires solders which have corresponding qualities. German silver belongs among the alloys which are very difficult of fusion, and the solders used for it are those which have very high fusing points, and belong therefore to the general class of hard solders. They have great strength, and are used for other purposes, in cases where the object to be soldered is exposed to heavy strain. German silver solder can be given a color very much like that of steel, and is much used in steel work.

In regard to its composition, it bears this relation to ordinary hard solders, that while these may be considered to be brass with an admixture of zinc, German silver

### (Silver Solders)

solder may be called a mixture of zinc and German silver solder. It is softer or harder according to the greater or less amount of zinc contained in it; but if this exceeds a certain limit, the solder becomes very brittle.

There are two principal varieties of German silver solder, called, relatively, hard and soft. The former is exceedingly strong, on account of the large amount of nickel it contains, and is sometimes called "steel solder," being generally used for soldering steel.

*Soft German Silver Solders*.—1.—Copper, 4.5; zinc, 7.0; nickel, 1.0.

2.—Copper, 35.0; zinc, 56.5; nickel, 8.5.

3.—German silver, 5; zinc, 4.

1 and 2 are quite similar in composition, and have correspondingly similar properties; in 3, German silver, that is, a compound of copper, zinc, and nickel, is used directly, and in preparing this solder it is necessary to know the exact composition of the alloy, or to try the solder in small quantities, in order to judge of the correct amount of zinc to be added. It may be assumed that the proportions are correct, when the metallic mixture is lustrous, and brittle enough to allow of pulverizing when hot, and when it will become fluid in contact with a red-hot soldering iron.

*Hard German Silver Solders (Steel Solders)*.—1.—Copper, 35; zinc, 56.5; nickel, 9.5.

2.—Copper, 38; zinc, 50; nickel, 12.

1 requires a very hot flame for melting, and 2 can usually be melted only by applying bellows to the flame.

### Silver Solders.

The solders which contain silver are very strong and tenacious, and are used not only to solder silver, but also for other metals, in cases where the objects to be soldered require great power of resistance. Two principal kinds of silver solder are distinguished, hard and soft, the former consisting of silver and copper, with sometimes a little zinc, and the latter containing, besides the metals just mentioned, a small amount of tin.

*Hard Silver Solder*.—According to the purpose for which this is intended, different compositions are used varying in fusibility. Silver workers use different solders for alloys of varying degrees of fineness, and the same ones are not always employed for resoldering as for the first soldering.

*Very Hard (for Fine Silver Articles)*.

—Copper, 1; silver, 4.



## Solders and Soldering

### (Gold Solders)

*Hard*.—1.—Copper, 1; silver, 20; brass,

9.

2.—Copper, 2; silver, 28; brass, 10.

*Soft*.—1.—Silver, 2; brass, 1.

2.—Silver, 3; copper, 2; zinc, 1.

3.—Silver, 10; brass, 10; tin, 1.

4.—These solders serve principally for completing the soldering of silver articles done with hard solder, by retouching imperfect places. Some silver workers use for this purpose copper and silver alloys mixed with zinc, as for example, the following: Copper, 4; silver, 12; zinc, 1; or: 5.—Silver, 5; brass, 6; zinc, 2. The latter is readily fusible, but also rather brittle, and is frequently used for soldering ordinary silverware.

*Solders for Iron, Steel, Cast Iron, and Copper*.—1.—Silver, 10; brass, 10.

2.—Silver, 20; copper, 30; zinc, 10.

3.—Silver, 30; copper, 10; tin, 0.5.

*Soft Silver Solder*.—Silver, 60; brass, 60; zinc, 5.

In the case of solders which are prepared with brass, care should be taken that neither of the metals in the composition contains iron, as it has been found by experience that the presence of a very trifling amount of this is sufficient to change the character of the alloy materially, making it brittle.

Silver solders are used in the form of fine filings or wire, the latter method of preparing it being especially adapted to the tenacious and ductile nature of the alloy.

In the large manufactories for silver ware it has become the custom in recent years to use the same alloy for soldering as that of which the silver article is made. It is used in the form of filings, and melted into the seams so that the object and the solder are really homogeneous.

### **Gold Solders.**

Gold, both pure and variously alloyed, is used to a considerable extent in soldering, but on account of its expensiveness it is limited to articles made of gold or platinum, or the most delicate small steel objects.

Gold alloys are of different colors, according to the kind and proportion of the other metals used. There are yellow, red, white, and green gold alloys. The color of the special alloy should of course be in harmony with the color of the object to be soldered, in order that the seams may be as inconspicuous as possible.

The fusibility of gold alloys varies as much as their color, and is lowered as the amount of gold in the alloy increases. Harder solders should therefore be used

### (Gold Solders)

for objects of fine gold than for a poorer quality.

Gold solders are made from gold and silver, gold and copper, and still more frequently from a mixture of all three of these metals; in some cases zinc is added, to make the solder softer. But this must not be done if the soldered articles are to be colored, as the zinc alloy will turn black in coloring. For objects which are to be wholly or partially enameled, the solders made of gold and silver, or of gold, silver, and copper, are the only ones used, and these are called "enamel solders."

*Pure Gold Solder*.—Before soldering apparatus had been devised by means of which platinum could be melted, pure gold was used for soldering articles made of this metal, such as are employed by chemists and in the manufacture of sulphuric acid. For this purpose, the gold is laid upon the seams in the form of fine rolled wire, or in thin strips, and melted with the oxy-hydrogen blowpipe. But experience has shown that platinum articles soldered with gold are far less durable than those made by direct melting together of the pieces of platinum with the blowpipe, especially in the case of the vessel used in distilling the English sulphuric acid. Of late years this process has become universal in the manufacture of platinum ware, and the gold is only used for repairing small platinum articles, such as the small crucibles and dishes for chemical laboratories. It requires a fierce white heat to melt it properly, and it is even then rather hard, so that the process of soldering demands great skill on the part of the workman.

*Hard Gold Solder*.—Gold 750-1000 fine (18 carat), 9; silver, 2; copper, 1.

This is used for the finest gold articles.

*Soft Gold Solder*.—Gold, 750-1000 fine (18 carat), 12; silver, 7; copper, 3.

This is likewise used for fine gold, but is much more fusible than the one first given.

*Gold Solder for Articles 583-1000 Fine (14 Carat)*.—1.—Gold, 583-1000 fine (14 carat), 3; silver, 2; copper, 1.

2.—Gold, 583-1000 fine (14 carat), 4; silver, 1; copper, 1.

*Gold Solder for Ordinary Gold Ware Less Than 583-1000 (14 Carat) Fine*.—1.—Fine gold, 1; silver, 2; copper, 1.

2.—Fine gold, 1; copper or silver, 1.

*Soft Gold Solder*.—1.—Fine gold, 11.94; silver, 54.74; copper, 28.17; zinc, 5.01.

2.—Gold, 583-1000 fine (14 carat), 10; silver, 5; zinc, 1.

## Solders and Soldering

### (Aluminum Solders)

*Enamel-Solder, Hard.*—Gold, 750-1000 fine (18 carat), 37; silver, 9.

*Enamel-Solder, Soft.*—Gold, 750-1000 fine (18 carat), 16; silver, 3; copper, 1.

The degree of fusibility of the enamel must decide the question as to which one of these compositions to use. If it is very hard, the first solder is the proper one, as otherwise the seams would become so hot during the process of melting the enamel that the solder itself would melt. For ordinary gold ware soft enamels are generally used, and in this case the softer solder can be employed. It is easily melted with the common soldering pipe; the harder can also be melted in the same way, but the use of a special apparatus makes the process much easier and quicker.

*To Remove Tarnish from Gold After Hard Polishing.*—Paint the gold over before soldering with a mixture of yellow ochre, ground up with water and a small quantity of borax. After soldering throw it into a pickle of water, 9 parts, and sulphuric acid,  $1\frac{1}{2}$  parts. If the gold is whitish looking and shows the silver alloy after being removed from this pickle, dip a moment in a hot solution of sulphuric acid and saltpeter. Wash, polish first with rotten stone and oil; then after washing, again polish with rouge.

### Aluminum Solders.

Since the discovery of aluminum and its production in considerable quantities, it has become a common material in the manufacture of various artistic objects. One of the greatest difficulties, however, in the past has been that there was no perfect solder for aluminum, and various alloys were used which gave unsatisfactory results. This difficulty has now been overcome, and it is possible to solder the metal so perfectly that in tests which have been made the metal itself broke before the solder gave way.

The French manufacturers use five kinds of solders for aluminum, all consisting of zinc, copper and aluminum in different proportions. These are given below. Parts by weight.

- 1.—Zinc, 80; copper, 8; aluminum, 12.
- 2.—Zinc, 85; copper, 6; aluminum, 9.
- 3.—Zinc, 88; copper, 5; aluminum, 7.
- 4.—Zinc, 90; copper, 4; aluminum, 6.
- 5.—Zinc, 94; copper, 2; aluminum, 4.

There are also other compositions besides these. Bourbonhouze recommends, for objects which are to be further manipulated or worked on after soldering, a mixture of 45 parts of tin and 10 of aluminum.

### (Aluminum Solders)

6.—Frischmuth gives the following alloys for solders:

a.—Silver, 10; copper, 10; aluminum, 20; tin, 60; zinc, 30.

b.—Tin, 95 to 99; bismuth, 5 to 8.

The composition b (an ordinary soft solder) is adapted for soldering aluminum by means of the common soldering iron.

In preparing aluminum solders, the alloy of copper and aluminum is always made first and the zinc added. First of all the copper is melted, and the aluminum put in gradually, usually in three or four portions. The two metals are of very different density, and the mixture should be stirred with an iron rod, to unite them as far as possible. Immediately after adding the last portion of the aluminum, the zinc is put in, and at the same time some fat or rosin is thrown into the kettle, the whole is quickly stirred, the kettle removed from the fire, and the alloy poured into iron molds which have been rubbed with coal oil or benzine. The whole work must be done as quickly as possible after the addition of the zinc or the solder will not remain in a suitable condition.

The zinc used should contain no iron, as a very small amount of the latter would materially affect the fusibility and durability of the solder. The purpose of the fat or rosin is to prevent the oxidation of the zinc, and, as before observed, the work must proceed as rapidly as possible from this moment, as the temperature of the mass is so high that if it were left long in fusion much of the zinc would evaporate.

On account of its resistance to chemical influences, aluminum solder is frequently used by dentists to unite the metallic parts of artificial teeth, but alloys for this purpose must not contain copper except in very small quantities, as this metal is easily attacked by acids.

*Platinum and Aluminum Solder.*—Gold, 30; platinum, 1; silver, 20; aluminum, 100.

*Aluminum and Gold Solder.*—Gold, 50; silver, 10; copper, 10; aluminum, 20.

*Solder for Aluminum Bronze.*—Aluminum and copper make a very beautiful alloy, and one of valuable properties, much used for soldering artistic objects. Aluminum bronze demands a special composition, and for this purpose a common soft (white) solder is generally used, mixed with zinc amalgam in different proportions, either 2, 4 or 8 parts of the solder to 1 of the amalgam. Zinc amalgam is an alloy of zinc and mercury. \*

## Solders and Soldering

### (Aluminum Solders)

evident from its name (amalgam), being the general designation for alloys of mercury with other metals. To prepare it 2 parts of zinc and 1 of mercury are united with heat. The zinc is melted, the mercury quickly stirred in and the mixture quickly cooled. It is a somewhat brittle alloy, silver white in color. To make the solder for aluminum bronze, the soft solder is melted, the zinc amalgam, finely powdered, added, and the mass at once poured out into molds.

The soldering must be done with a soldering tool made of pure aluminum; the solder would easily enough adhere, to be sure, to other metals, but would alloy itself with them, and its composition would be changed.

In using the five aluminum solders given above, the kind of soldering to be done must be taken into consideration. For small ornamental objects, for instance, No. 1 may be used; for larger articles, such as teapots, coffee pots, etc., No. 4 is much frequently employed.

Originally the solders composed of aluminum and zinc were the only ones used for aluminum articles. Large objects were first put together with an easily fusible solder and the soldering finished with a harder one. The alloys of aluminum and zinc have the disadvantage that they oxidize easily in melting, and the work is made much more difficult thereby. This can be remedied by dipping the fine grains of the solder (in which form it is used) in copaiva balsam, which acts as a reducing agent, besides excluding the air. But this is not necessary if the compositions containing copper are employed.

*How to Solder Aluminum.*—There is no solder which operates with aluminum in the same way that ordinary solders operate with copper, tin, etc. There are two reasons for this.

First—Aluminum does not alloy readily with solders at temperatures as low as the other metals require, and it is consequently necessary, in soldering aluminum, to use a much higher temperature. Furthermore, aluminum alloys with lead only with great difficulty and with but a small proportion of lead at that, consequently lead solders are useless with aluminum.

Second.—The surface of all aluminum is covered with a thin invisible coating of aluminum oxide. This coating forms instantly on the surface of aluminum and is very refractory, and its presence is responsible for the high resistance of aluminum to corroding agents, since, although

### (Aluminum Solders)

aluminum itself is soluble in a great many chemical compounds, this protective coating of oxide is insoluble in almost everything excepting hydrofluoric acid. While in general this coating of oxide is beneficial, in that it forms a perfect protection to the aluminum underneath, it is, by reason of its efficiency in this particular, responsible for the principal portion of the difficulty which occurs in soldering aluminum, as naturally no solder will alloy with aluminum oxide.

In soldering aluminum, therefore, it is necessary that this oxide be removed before the soldering can take place, and as it forms again instantly after removal, it is necessary that the removal of the oxide and the covering with solder shall be simultaneous. In soldering other metals, the oxide can be removed chemically. With aluminum this is not possible, and it must be removed mechanically by abrasion.

Bearing these facts in mind, it will be readily understood how aluminum soldering must be done. All the surface to which it is intended that the solder shall adhere must first be tinned. This is accomplished by heating the metal to a temperature above the fusion point of the solder used, and then rubbing the surface with a stick of the solder, thus rubbing the oxide off the surface with the solder itself and covering the exposed points with melted solder, all in the same motion. In order to make sure that the tinning is thorough, it is better to rub the surface with a steel or brass scratch brush while the solder on this surface is still molten. This insures a thorough job of tinning. After the edges to be united are thus tinned they may be sweated together with pure block tin, with the aid either of a soldering iron or blast lamp.

With regard to the composition of aluminum solders, zinc appears to alloy with aluminum more readily than any other metal available for the constituent part of the solder, consequently all solders which will readily tin aluminum contain zinc in varying proportions. The solders which we have found to be most satisfactory are composed usually of tin, zinc and a very small proportion of aluminum. These solders do not run very freely nor fuse as readily as ordinary solders, and it is necessary, as stated above, to use a higher temperature—so high in fact that extreme difficulty is found in using these solders with a soldering iron, and it is generally necessary to use a blast lamp.

Another thing which must be borne in mind is that solder will not flow into an

## Solders and Soldering

### (Cold Soldering)

aluminum joint, even when tinned, by capillary action as it does into copper or tin joints, and it is therefore necessary to place on the surface to be united all of the material necessary to sweat them together before the edges are brought into contact. In soldering aluminum joints it is necessary that both the tinning and sweating shall be most thoroughly done, otherwise the joint will not be durable.

On account of the presence of zinc in the tinning solders, the solder is decomposed by moisture, and unless the work is so well done that the joint is absolutely waterproof, it will not be durable. The quality of the workmanship has more influence than anything else on the permanence of the work.

### SOLDERS FOR SPECIAL PURPOSES

#### Brass.

For soldering with sheet brass with a copper, use a solder made of 2 parts tin, 1 part lead, by weight; melt, mix and pour in small bars. For flux dissolve zinc in muriatic acid until no more will dissolve, add about one-tenth its bulk of sal ammoniac and dilute with quarter its bulk of water. Wet the surfaces to be soldered with this solution, using a piece of wood or copper wire for this purpose. Then, by rubbing the surfaces with the tinned point of the copper, a coating of tin will be imparted. Put both surfaces thus prepared together and heat by applying the copper and a little solder to the outside of the seam. The copper should be well tinned on the point, which may be done by heating the copper hot enough to freely melt pure tin. Rub a piece of sal ammoniac on a brick, then rub the copper point on the brick, with tin or solder in contact with the point. The tinning of the copper point is essential for soldering.

#### Britannia Ware, White Solder.

Tin, 50 lb.; copper, 4 lb.; tin, 2 lb.; antimony, 4 lb.

#### Can Tops, Sealing Solder.

For sealing tops of canned goods: Lead,  $1\frac{1}{4}$  lb.; tin, 2 lb.; bismuth, 2 oz. Melt the lead first, add the tin, stir the bismuth in well just before pouring. This makes a soft solder and the cans do not take much heat to open them.

#### Cold or Chemical Soldering.

1.—A neat mode of soldering for small articles: Cut a piece of tinfoil the size of the surfaces to be soldered; dip a

### (Cold Soldering)

feather in a solution of sal ammoniac and paint over the surfaces of the metal; then place them in their proper position, with the tinfoil between; put it so arranged on a piece of iron hot enough to melt the foil; when cold they will be found firmly fastened together. For soldering without the use of an iron the parts to be joined are made to fit accurately, either by filing or on a lathe. The surfaces are moistened with soldering fluid, a smooth piece of tinfoil is laid on, and the pieces are pressed together and tightly wired. The article is then heated over the fire by means of a lamp until the tinfoil melts. In this way two pieces of brass can be soldered together so nicely that the joint can scarcely be found. Flux.—Hydrochloric acid with zinc dissolved in it till it will take no more.

2.—Various nostrums have been proposed from time to time which profess to be reliable methods of soldering without heat, but when tried, they have generally proved useless. The following recipe, which is due to Fletcher, of Warrington, will be found to be more trustworthy. It must be borne in mind that, though the first preparation is tedious, a large quantity of the materials can be made at once, and the actual soldering process is as simple and quick as it will can be.

Flux.—1 part metallic sodium to 50 or 60 parts of mercury. These combine on being well shaken in a bottle. If this is too much trouble, the sodium amalgam can be bought, ready made, from any chemist or dealer in reagents. This sodium amalgam must be kept in a stoppered bottle closed from the air. It has the property of amalgamating (equivalent to tinning by heat) any metallic surface, cast iron included.

Solder.—Make a weak solution of copper sulphate, about 1 oz. to 1 qt. of water. Precipitate the copper by rods of zinc; wash the precipitate 2 or 3 times with hot water; drain the water off and add for every 3 oz. of precipitate 6 or 7 oz. mercury; add also a little sulphuric acid to assist the combination from the two metals. When combined, they form a paste which sets intensely hard in a few hours, and this paste should be made, while soft, into small pellets. When wanted for use, heat one or more of the pellets until the mercury oozes out from the surface in small beads; shake or wipe them off and rub the pellet into a soft paste with a small mortar and pestle or by any other convenient means until it is as smooth and soft as painter's white lead. This, when put on a surface pre-

## Solders and Soldering

### (Glass Soldering)

viously amalgamated by the sodium and mercury, adheres firmly and sets perfectly hard in about 3 hours. The joint can be parted, if necessary, either by a hammer and cold chisel or by a heat about sufficient to melt plumbers' solder.

#### Enamel Solder.

Copper, 25 parts; silver, 7.07 parts; gold, 67.93 parts.

*Refractory Enamel Solder.*—Silver, 18 parts; gold, 74 parts.

#### Glass and Porcelain Soldered with Metals.

Mr. Cailletet has recently made known to the Société de Physique a process of soldering glass and porcelain with metals. Mechanics, physicists and chemists will appreciate the practical importance of this process, which permits of adapting any metallic object whatever (cock, tube, conducting wire, etc.) to experimental apparatus in such a way as to prevent any leakage, even under high pressures. The process is very simple. The portion of the tube that is to be soldered is first covered with a thin layer of platinum. This deposit is obtained by covering the slightly heated glass by means of a brush with very neutral chloride of platinum, mixed with essential oil of chamomile. The oil is slowly evaporated, and, when the white and odoriferous vapors cease to be given off, the temperature is raised to a red heat. The platinum is then reduced and covers the glass tube with a bright layer of metal. On fixing the tube thus metallized, and placed in a bath of sulphate of copper, to the negative pole of a battery of suitable energy, there is deposited upon the platinum a ring of copper, which should be malleable and very adhesive if the operation has been properly performed. In this state the glass tube covered with copper can be treated like a genuine metallic tube and be soldered by means of tin to iron, copper, bronze, platinum and all metals that can be united with tin solder. The resistance and strength of such soldering are very great. Mr. Cailletet has found that a tube of his apparatus for liquefying gases, the upper extremity of which had been closed by means of an adjunctage thus soldered, resists pressures of more than 300 atmospheres. The tube, instead of being platinized, may be silverized by raising the glass covered with nitrate of silver up to a heat bordering on red. The silver thus reduced adheres perfectly to the glass, but numerous experiments have caused plati-

### (Platinum to Gold.)

nizing to be preferred to silverizing in the majority of cases.

#### Glass Soldered Together.

This is effected with the aid of a metal alloy consisting of 95 parts of tin and 5 parts of zinc. The melting point of this alloy is about 425° F. The glass to be soldered is first carefully heated to the above temperature and the alloy is then spread on the glass with the aid of a soldering iron and on cooling it will be firmly attached to the glass. An alloy of 90 parts of tin and 10 parts of aluminum can also be used for the same purpose, but not so conveniently, as it does not melt until it reaches 830° F.

#### Glaziers' Solder.

Lead, 5 parts; tin, 12-3 parts. This melts at 500° F.

#### Iron.

To solder cast iron, clean the place to be soldered well, then brush it with a brass wire brush until the iron becomes yellow. It will be found that the solder can now be applied without any trouble.

#### Nickel, Solders for.

For fine or high-grade nickel: 3 parts of yellow brass, 1 part of sterling silver. For low-grade nickel: 15 parts of yellow brass, 5 parts of sterling silver, 4 parts of zinc (pure or plate zinc). Melt the brass and silver with borax for a flux and add the zinc in small pieces, stir with an iron rod, pour into a slab mold and cool slowly, when it can be rolled thin for cutting.

#### Pewter and Britannia Metal.

1.—Tin, 10 parts; lead, 5 parts; bismuth, 1 to 3 parts.

2.—Take tin, 3 parts; lead, 1½ parts; bismuth, 1½ parts.

3.—Solder for Tin or Pewter.—Tin, 2 parts; lead, 1 part; bismuth, 1 part.

4.—Soldering Pewters and Compo. Pipes.—These require powdered rosin as a flux, with very thin strips of the more fusible solders, care being taken that the soldering iron is not too hot.

#### Platinum Soldered to Gold.

To make platinum adhere firmly to gold by soldering it is necessary that a small quantity of fine or 18-carat gold shall be sweated into the surface of the platinum at nearly a white heat, so that the gold shall soak into the face of the platinum; ordinary solder will then adhere firmly to the face obtained in this manner. Hard solder acts by partially

## Solders and Soldering

### (Steel Soldering)

fusing and combining with the surfaces to be joined, and platinum alone will not fuse or combine with any solder at a temperature anything like the fusing point of ordinary gold solder.

#### Steel.

*Steel Soldering.*—This recipe, according to the *Werkmeister Zeitung*, is useful for cases when the steel is not to be soldered at an elevation of temperature to the bright red. Dissolve scraps of cast steel in as small a quantity as possible of nitric acid, add finely pulverized borax and stir vigorously until a fluid paste is formed, then dilute by means of sal ammoniac and put in a bottle. When soldering is to be done, apply a thin layer of the solution to the two parts to be soldered, and when these have been carried to ordinary redness, and the mass is consequently plastic, beat lightly on the anvil with a flat hammer.

*Steel Wire, To Solder.*—Mix 1 lb. lactic acid, 1 lb. glycerine and 8 lb. water, so as to have a clear solution. This is non-corrosive, but does not work as quickly as the ordinary soldering acid.

*Steel Joints, Solder for.*—Brass, 3 parts; copper,  $1\frac{1}{2}$  parts; silver,  $28\frac{1}{2}$  parts.

### (Useful Solder)

*Steel, Hard Soldering.*—Solder will not run on iron quite so well as on silver or brass. See that the steel is clean and bright, use the borax as a thick paste and the operation must be concluded quickly.

#### A Useful Kind of Solder.

A soft alloy which attaches itself so firmly to the surface of metals, glass and porcelain that it can be employed to solder articles that will not bear a very high temperature can be made as follows: Put copper dust obtained by precipitation from a solution of the sulphate by means of zinc into a cast-iron or porcelain-lined mortar and mix with strong sulphuric acid, sp. gr. 1.85. Take from 20 to 30 or 36 parts of the copper, according to the hardness desired. To the cake formed of acid and copper add, under constant stirring, 70 parts of mercury. When well mixed carefully rinse the amalgam with warm water to remove all the acid and then set aside to cool. In 10 or 12 hours it is hard enough to scratch tin. When used heat it so hot that when worked over and brayed in an iron mortar it becomes as soft as wax. In this ductile form spread it out on any surface; it will adhere with great tenacity when it gets cold and hard.



## CHAPTER XXV

# TOILET PREPARATIONS AND PERFUMES

## BRIEF SCHEME OF CLASSIFICATION

BATH PREPARATIONS  
BLEACHING THE SKIN  
CHAPS  
CORN  
COSMETICS AND CREAMS  
CREAMS  
COURT PLASTER  
DEPILATORIES  
FOOT POWDERS  
FRECKLES AND TAN  
HAIR PREPARATIONS  
LIP SALVES  
MANICURE PREPARATIONS  
MOUTH WASHES, ETC.

PERFUMES  
BAY RUM  
COLOGNE  
ESSENCES AND EXTRACTS  
FUMIGATING PREPARATIONS  
POTPOURRI  
SACHET POWDERS  
SMELLING SALTS  
TOILET WATERS  
POWDERS  
ROUGES  
SHAVING PREPARATIONS  
SUNBURN  
THEATRICAL PAINTS  
TOOTH PREPARATIONS

### Bath Preparations.

*Acid Bath.*—Diluted nitro-hydrochloric acid,  $\frac{1}{2}$  fl.oz.; water, 1 gal. Make 25 to 30 gal. for a full-size bath.

*Alcohol.*—Castile soap, shavings, 2 av.oz.; potassium carbonate, 1 av.oz.; glycerine, 2 fl.oz.; oil of lavender flowers, 1 fl.dr.; oil of bergamot,  $\frac{1}{2}$  fl.dr.; oil of rosemary,  $\frac{1}{2}$  fl.dr.; alcohol, 10 fl.oz.; water, enough to make 16 fl.oz. Digest the soap in 4 fl.oz. of water, with gentle heat; when solution is effected add the potassium carbonate and glycerine; dissolve the oils in the alcohol, and add to the soap solution, and when a perfect solution has taken place filter through paper.

*Alkaline Bath.*—1.—Sodium carbonate, in crystals, 60 to 120 gr.; water, 1 gal. Make 25 to 30 gal. for full-size bath.

2.—Sodium carbonate, in crystals, 5 oz.; water, 30 gal. Dissolve.

3.—Sodium carbonate, 6 oz.; borax, 1 oz. Dissolve in 1 qt. of hot water and add to an ordinary tub of water, say 30 gal. Of course, the powder may be perfumed with essential oils to suit.

*Boric Acid.*—Boric acid, 2 to 5 oz.; water, 1 gal. Make 25 to 30 gal. for a full-size bath.

*Creosote Vapor Bath.*—Coal-tar creosote, 1 to 4 fl.oz. Heat the creosote in a porcelain or metal dish, over a lamp, in a well closed apartment, continuing the application of heat until the creosote

vapor in the atmosphere has reached the desired concentration.

*Effervescent Bath.*—1.—Sodium bicarbonate,  $\frac{1}{2}$  oz.; sodium acid sulphate,  $\frac{1}{4}$  oz.; water, 1 gal. Dissolve the sodium bicarbonate in the water, and add the sodium acid sulphate, in lumps or cakes, to the solution. Make 25 to 30 gal. for a full-size bath. Contact between the patient's skin and the acid sulphate should be prevented by placing sheets of lead foil over the latter.

2.—Sodium bicarbonate,  $\frac{1}{2}$  oz.; sodium acid sulphate,  $\frac{1}{4}$  oz.; sodium chloride,  $1\frac{1}{2}$  oz.; calcium chloride,  $\frac{1}{4}$  oz.; water, 1 gal. Dissolve the sodium bicarbonate and the chlorides in the water, then add the sodium and acid sulphate. Make 25 to 30 gal.

*Emollient Bath.*—Barley meal, 1 lb.; wheat bran, 2 lb.; borax, 1 oz. Dissolve, as far as possible, in 2 qt. of warm water, and strain into an ordinary bath.

*Medicated Bath Powders.*—1.—Simple Basis.—Coarse oatmeal,  $\frac{1}{2}$  oz.; powdered borax, 1 dr.; powdered soap, 1 dr. Mix, and stitch in a muslin bag.

2.—Beta Naphthol.—Beta naphthol, 60 gr.; simple basis No. 1, for 1 bag.

3.—Birch Tar.—Oil of birch tar (ol. rusci), 3 fl.dr.; simple basis No. 1, for 1 bag. Put each in parchment envelope.

4.—Creolin.—Creolin, 90 minims; simple basis No. 1, for 1 bag.

5.—Juniper.—Juniper tar oil (ol. ca-

Always consult the Index when using this book.



## Toilet Preparations

### (Bath Preparations)

dinum), 3 fl.dr.; simple basis No. 1, for 1 bag.

6.—Pine extract.—Extract of *Pinus sylvestris*, 90 gr.; simple basis No. 1, for 1 bag.

7.—Resorcin.—Resorcin, 60 gr.; simple basis No. 1, for 1 bag.

8.—Resorcin and Ichtyol.—Resorcin, 60 gr.; ichtyol, 60 gr.; simple basis No. 1, for 1 bag. Put each in a parchment envelope.

9.—Sulphur, Camphor and Balsam of Peru.—Sulphur, 1 dr.; camphor, 30 gr.; balsam of Peru, 10 minims; simple basis No. 1, for 1 bag. Put each in a parchment envelope.

10.—Sulphur, Camphor and Carbolic.—Sulphur, 1 dr.; camphor, 30 gr.; carbolic acid, 30 gr.; simple basis No. 1, for 1 bag. Put each in parchment envelope.

11.—Thymol and Wintergreen.—Thymol, 2 gr.; oil of wintergreen, 60 minims; simple basis No. 1, for 1 bag.

*Milk Bath.*—Marshmallow flowers, 8 oz.; hyssop herb, 4 oz.; wheat bran, 4 lb.

*Mustard Bath.*—Mustard,  $\frac{1}{2}$  to 1 oz.; water, 1 gal. Rub the mustard to a smooth paste with cold water before adding it to the hot water. If used for a child, give the bath until the arms of the person holding the child begin to tingle.

*Pasta Mack.*—It is said that a preparation for use in the bath which somewhat resembles this may be made by the following formula: Sodium bicarbonate, 15 dr.; tartaric acid,  $12\frac{1}{2}$  dr.; starch flour, 21 dr.; sweet almond oil, 9 dr.; oil of rose, 3 drops; oil of neroli, 1 drop. Mix the acid and the bicarbonate separately with portions of the starch flour, then mix together and add the oils. Of this paste, 1 teaspoonful is sufficient to perfume 12 gal. of water.

*Paste.*—Soft soap, 8 oz.; glycerine, 1 oz.; 94% alcohol, 4 dr.; oil of lavender, 4 drops. Mix the oil, alcohol and glycerine, and carefully mix with the soap to form a paste.

*Perfumed Water Softener.*—1.—Borax, 1 oz.; sodium bicarbonate,  $\frac{1}{2}$  oz.; oil of lavender, 1 oz.; oil of bergamot, 1 oz.; oil of lemon, 1 oz.; oil of cloves, 1 dr.; oil of cinnamon, 1 dr.; alcohol, 2 qt.; distilled water, to make 6 qt. Dissolve the oils in the alcohol and the salts in the water, and mix the two solutions. Let stand for 24 hours, and filter.

2.—Borax, 1.5 grams; dissolved in glycerine, 30 grams; rose water, 100 grams; then mix with cologne water, 20 grams; tincture of quillaja, 50 grams. Stand aside several days, and filter. The

### (Bath Preparations)

quantity of borax or of borax and sodium bicarbonate may be increased or decreased as desired.

3.—A heaping teaspoonful of the following paste will perfume 12 to 15 gal. of bath water: Sodium bicarbonate, 150 parts; tartaric acid, 125 parts; powdered starch, 210 parts; oil of sweet almond, 90 parts; attar of rose or ylang-ylang, q. s. Mix the soda, acid and starch, and make into a paste with the almond oil, working in the perfume. As to the latter, 20 drops of attar of rose and 8 to 10 drops of clove oil to each pound of paste will be sufficient. It is claimed that the paste also softens the bath water.

*Powder.*—1.—Tartaric acid, 10 oz.; sodium bicarbonate, 9 oz.; rice flour, 6 oz. Perfume with a mixture of the following oils: Oil of neroli, 2 dr.; oil of rosemary, 1 dr.; oil of bergamot, 1 dr.; oil of cedar,  $2\frac{1}{4}$  dr.; oil of orange,  $2\frac{1}{4}$  dr. A fluid dram of this mixture is sufficient to perfume 1 lb. of the above bath powder.

2.—Sodium bicarbonate, 4 oz.; sodium borate, 4 oz.; cosin, a sufficient quantity; oil of bergamot, 1 dr.; oil of neroli, 20 minims; oil of rosemary, 20 minims.

3.—Powdered borax, 4 oz.; salicylic acid, 60 gr.; essence of cassia, 1 dr.; essence of jasmine, 1 dr.; oil of lavender flowers, 20 drops. Rub the oil and extract with the borax and salicylic acid until the alcohol is evaporated. Use a heaping teaspoonful to the body bath.

*Salt.*—Acid Bath Salt.—Tartaric acid, 1 av.oz.; potassium bitartrate, 2 av.oz.; potassium bicarbonate, 1 av.oz.; sodium chloride, 12 av.oz. Have all the salts in a coarse granular condition, and mix.

Alkaline Bath Salt.—Sodium bicarbonate, 6 av.oz.; sodium sulphate, 2 av.oz.; sodium chloride, 8 av.oz. Have all the salts in a coarse granular condition and mix.

Iodo-Bromide Bathing Salt.—Rock salt, 300 gr.; potassium chlorate, 40 gr.; calcium chloride, crystals, 600 gr.; magnesium chloride, 50 gr.; lithium chloride, 2 gr.; potassium iodide, 1 gr.; potassium bromide, 20 gr. Mix.

Iron Bath Salt.—Iron sulphate, 1 av.oz.; sodium sulphate, 2 av.oz.; magnesium sulphate, 1 av.oz.; sodium chloride, 12 av.oz. Mix.

Sea Bath Salt.—Potassium iodide, 10 gr.; potassium bromide, 20 gr.; magnesium sulphate, 2 av.oz.; sodium bicarbonate, 1 av.oz.; sodium chloride, q. s. ad 16 av.oz. Have all the salts in a coarse granular condition and mix.

*Tablets.*—1.—Sodium carbonate, 4 oz.; tartaric acid,  $1\frac{1}{2}$  oz.; orris root,  $\frac{1}{2}$  oz.;

## Toilet Preparations

### (Chapped Skin)

oil of lemon,  $\frac{1}{2}$  dr.; oil of orris (or ionone), 5 minims; oil of ylang-ylang, 5 minims. Mix the oils with the orris root, add the other ingredients, and make into a stiff paste with alcohol. Divide into suitable sized tablets and dry.

2.—Powdered borax, 4 oz.; salicylic acid, 1 dr.; essence of cassie, 1 dr.; essence of jasmine, 1 dr.; oil of lavender flowers, 20 drops. Rub the oil and extracts with the borax and salicylic acid, and form into tablets with a little alcohol.

### Bleaching the Skin.

*Face Bleach or Beautifier.*—Syrupy lactic acid, 40 oz.; glycerine, 80 oz.; distilled water, to 5 gal. (U. S.); mix, and gradually add tincture of benzoin, 3 oz. Color by adding carmine No. 40, 40 gr.; glycerine, 1 oz.; ammonia solution,  $\frac{1}{2}$  oz.; water, to make 3 oz. Heat this to drive off the ammonia, and mix all. Shake, set aside, then filter, and add solution of ionone, 1 dr. Add a few drams of kaolin and filter until bright.

*Hands, To Whiten.*—Lanoline, 30; glycerine, 20; borax, 10; eucalyptol, 2; essential oil of almonds, 1. A mixture of these ingredients is to be rubbed on the hands, which are then covered with gloves during the night.

*Skin Salves.*—A skin-bleaching action, owing to the presence of hydrogen peroxide, is possessed by the following mixture: Lanoline, 30 grams; bitter almond oil, 10 grams. Mix, and stir with this salve base a solution of borax, 1 gram; glycerine, 15 grams; hydrogen peroxide, 15 grams.

### Chapped Skin.

The effect of cold is to diminish the caliber of the cutaneous blood vessels by producing contraction of their coats. Hence there is a lessened supply of blood to the skin and a lessened nutrition, accompanied by a secretion of the cutaneous glands. The deficient secretions must be replaced by an outward application. The following formula will be of service:

1.—White wax, 1 part; borax, 3 parts; juice of bitter almonds, 1 part; oatmeal water, 3 parts.

2.—Milk, 1 part; chalk, 2 parts; glycerine, 1 part.

3.—Spermaceti, 2 parts; white wax, 1 part; glycerine, 1 part; chalk, 3 parts; oatmeal water, 2 parts.

4.—Chaptal's Water for Chapped Breasts.—Sulphate of alumina, 1 dr.; sulphate of zinc,  $\frac{1}{2}$  oz.; borate of soda, 4 gr.; rose water, 6 oz.

### (Corn Cures)

5.—Cacao butter, 3 oz.; oil of sweet almond, 3 oz.; white wax, 3 oz.; oil of lavender, 1 dr.; oil of rosemary, 1 dr. Melt the first three ingredients together, stir until nearly cold, and then add the perfume.

6.—Glycerine, 6 oz.; quince seed, 60 gr.; hot water, 21 oz.; deodorized alcohol, 5 oz. Perfume as desired. Place the quince seed in a bottle, pour the hot water on them, and agitate occasionally until a mucilage is formed; then strain through muslin. To this add the glycerine, and shake thoroughly. Dissolve the desired perfume in the alcohol, and add the solution to the mucilage, agitating briskly until of a uniform consistency. An agreeable way of perfuming this mixture is by substituting a portion of the alcohol with cologne water; and by the latter is meant one of the original orange-flower type. If the preparation should prove either too thin or too solid to meet the views of the operator, a variation in the quantity of quince seed will, of course, yield the desired result. A similar preparation may be made by the use of tragacanth.

7.—If a liquid preparation is desired, use glycerine, 1 part; rose or other scented water, 9 parts. When glycerine is used alone as an emollient, it is apt to prove objectionable on account of its "stickiness"; by dilution as above, this objection is largely overcome, and the preparation is quite agreeable and efficient.

8.—*Cracked Hands.*—Various receipts are given for this, as follow:

a.—Camphor, 60 gr.; boric acid, 30 gr.; lanoline and white vaseline, of each  $\frac{1}{2}$  oz.; to make an ointment.

b.—Anoint your hands with glycerine after washing, and while they are still damp. If used without some water it has a drying tendency. Vaseline is no good.

c.—Mix a powdered ball of sal pruned with 2 oz. of vaseline, and rub well in.

9.—Pomatum for Chapped Lips.—Lard, 16 parts; cacao oil, 24 parts; spermaceti, 8 parts; yellow wax, 3 parts; alcaenna root, 1 part. The substances are fused for a quarter of an hour at a gentle heat, then strained through a cloth and mixed with oil of lemon, oil of bergamot, of each 1-6 part; oil of bitter almonds, 1-15 part; when the mass is poured into suitable vessels to cool.

### Corn Cures.

*Liquids.*—1.—Salicylic acid, 11 parts; extract of cannabis indica, 2 parts; al-

## Toilet Preparations

### (Corns)

cohol, 10 parts; flexible collodion, to make 100 parts. Dissolve the extract in the alcohol and the salicylic acid in about 50 parts of the collodion contained in a tared bottle; then add the former solution to the latter, and add enough collodion to make 100 parts.

2.—Extract of cannabis indica, 1 part; salicylic acid, 10 parts; oil of turpentine, 5 parts; collodion, 82 parts. Dissolve, and add acetic acid, 2 parts.

3.—Cocaine hydrochlorate, 2 parts; salicylic acid, 30 parts; alcohol, 120 parts; extract of cannabis indica, 8 parts; collodion, 120 parts.

4. Extract of cannabis indica, 1 part; salicylic acid, 10 parts; larch turpentine, 10 parts; collodion, 77 parts. Dissolve by agitation, and add glacial acetic acid, 2 parts.

5. Salicylic acid, 1 part; lactic acid, 1 part; collodion, 8 parts.

**Plasters.**—The advertised corn plasters commonly consist of rosin plaster, galbanum plaster, or pitch plaster, with or without the addition of verdigris or sal ammoniac, or both of them, spread on linen, leather or paper; the spread plaster being afterward cut into pieces of appropriate size, and "put up" in small flat boxes. The following are a few examples:

1.—Rosin plaster, 5 parts; melt it by a gentle heat, stir in sal ammoniac, in very fine powder, 1 part, and at once spread it on linen or white sheepskin.

2. Galbanum plaster, 1 oz.; verdigris, in fine powder, 1 dr.; as the last.

3. Rosin plaster, 2 oz.; black pitch, 1 oz.; verdigris, 1 dr.; sal ammoniac, 1 dr.

4.—Argentine Corn Plaster.—Rosin plaster, 7 parts; fused nitrate of silver, in fine powder, 1 part, as before. Intended as a substitute for the direct application of lunar caustic, and to be applied to the corn only.

5.—Anodyne Corn Plaster.—Galbanum plaster or rosin plaster, or the product of either Nos. 6 or 7, to each ounce of which 1 dr. of opium, in fine powder, has been added. Recommended for painful corns and bunions.

**Salves.**—1.—Powdered lead acetate, powdered myrrh, powdered camphor, litharge, equal parts; sweet oil and petrolatum, of each sufficient. Mix the powders into a stiff paste with sweet oil, and add enough petrolatum to bring up to the consistency of an ointment.

2.—Powdered verdigris, 6 parts; savine ointment, 42 parts; extract of cannabis indica, 1 part.

### (Cosmetics)

3.—Salicylic acid, 2 parts; balsam of Peru, 2 parts; rosin, 2 parts; Venice turpentine, 3 parts; petrolatum, 4 parts; beeswax, 24 parts.

#### Cosmetics and Creams.

**Almond Balls.**—1.—Spermaceti, 2 oz.; pure white wax, 4 oz.; oil of almonds,  $\frac{1}{2}$  pt. Melt them together in an earthenware pot by the heat of a water bath, and when the mixture has cooled a little add essential oil of almonds, 1 dr.; expressed oil of mace,  $1\frac{1}{2}$  dr. Stir the mixture constantly until it begins to cool, then pour it into slightly warmed molds, which may be ounce gallipots or egg cups with smooth bottoms. This will form hemispherical cakes.

2.—Hard clarified suet, 14 oz.; white wax, 2 oz.; melt, and add essential oil of almonds, 1 dr.; oil of cloves (or pimento),  $\frac{1}{2}$  dr. Proceed as in No. 1. Cheaper and inferior to the first. Rub it into the skin. They may be colored by adding the coloring material while the whole is in a fluid state.

3.—Almond Cream (Crème d'Amandes).—Lard, perfectly pure and fresh, 220 parts; solution of potassa, containing 26% of caustic potash, 120 parts; 60% alcohol, 10 parts; oil of bitter almonds, q. s. Triturate in a porcelain or Wedgwood mortar the lard and potassa solution, and let it stand a few hours. Then add the alcohol and sufficient oil of bitter almonds to give it the proper flavor. Finally, triturate until the mass is uniform and resembles mother of pearl. This cream has a handsome look, but is not so bland as other varieties mentioned below.

**Amandine.**—This is an article used to whiten and soften the skin, and in the winter to prevent chaps. The recipe below gives an amandine that is transparent: Fine pale honey, or strong syrup, 4 oz.; white soft soap (made from lard and potassa), 2 oz. Mix them thoroughly in a Wedgwood mortar, adding, if necessary, of liquor of potassa, 2 or 3 teaspoonfuls, so as to produce a thoroughly homogeneous paste. To this add, and rub in by degrees and very gradually, oil of almonds,  $3\frac{1}{2}$  lb., previously mixed and scented with essential oil of almonds, essence of bergamot, of each 3 dr.; oil of cloves, balsam of Peru, of each  $1\frac{1}{2}$  dr.; and continue the trituration until the whole assumes the appearance of a rich transparent jelly. Finally, put the paste into pots or wide-mouthed bottles. The balsam ought to be triturated with a little of the almond oil, warm, before adding it to the rest, and after all the scents are

## Toilet Preparations

### (Cosmetics)

added the oil should be allowed to settle for 2 or 3 days, and the clear portion only used. In using, a lump of amandine the size of a large pea is rubbed with a few drops of warm water, and the rich white lather applied to the hands, face, neck, etc. In a short time the skin may be wiped with a soft napkin. Amandine may be glycerinated by adding 1 oz. of the best glycerine for every pound of oil to be used.

**Beauty Cream.**—It is claimed the following gives the skin a beautiful, smooth and fresh appearance, and at the same time serves to protect and preserve it: Powdered alum, 10 grams; whites of 2 eggs; boric acid, 3 grams; tincture of benzoin, 40 drops; olive oil, 40 drops; mucilage of acacia, 5 drops; rice flour, q. s.; perfume, q. s. Mix the alum and the white of eggs, without any addition of water whatever, in an earthen vessel, and dissolve the alum by the aid of very gentle heat (derived from a lamp, or gas-light, regulated to a very small flame), and constant, even stirring. This must continue until the aqueous content of the albumen is completely driven off. Care must be taken to avoid coagulation of the albumen, which occurs very easily, as all know. Let the mass obtained in this manner get completely cold, then throw into a Wedgwood mortar, add the boric acid, tincture of benzoin, oil, mucilage (instead of which a solution of fine gelatine may be used), etc., and rub up together, thickening it with the addition of sufficient rice flour to give the desired consistency, and perfuming at will. Instead of olive oil, any pure fat or fatty oil may be used, even vaseline or glycerine.

**Benzoinated Cream.**—Benzoinated lard, 8 dr.; wool fat, 3 dr.; spermaceti, 18 dr.; camphor, 4 dr.; oil of sweet almonds, 13 dr.; benzoic acid, 5 gr. Melt the fat together, and add the oil, in which the camphor has previously been dissolved by the aid of a gentle heat. Add the benzoic acid, keeping the mixture at all times as cool as practicable to prevent volatilization, and perfume with 6 or 8 drops of oil of cajuput, or other oil, according to fancy.

**Cacao Buttermilk.**—Powdered borax, 5 dr.; powdered Castile soap, 1 oz.; cacao butter, 3 oz.; coconut oil, 1 oz.; water, 4 oz. Rub together in a warm mortar for 10 minutes, then dilute very gradually with rose water, at 40° C., 42 oz. Shake the mixture well, and perfume with oil of bergamot, 40 gtt.; oil of neroli, 10 gtt.; oil of orris, 2 gtt.; vanilla sugar, 5 dr.; previously rubbed together.

### (Cold Cream)

**Camphor Cerate.**—Olive oil,  $\frac{1}{2}$  lb.; pure white wax,  $\frac{1}{4}$  lb.; spermaceti, 2 oz.; camphor,  $\frac{1}{2}$  oz. Mix as directed under "camphor balls." Used as an application to chaps, chilblains, abrasions, excoriations, etc.; also as lip salve in cold weather, as a hair cosmetic, and as a mild stimulating and anodyne friction.

**Camphor Ice.**—1.—Oil of sweet almonds, 2 oz.; spermaceti, 4 oz.; white wax, 2 oz.; camphor,  $\frac{1}{2}$  oz. Melt them over a water bath, run in molds of proper size and form.

2.—Expressed oil of almonds and rose water, each 1 lb.; white wax and spermaceti, of each 1 oz.; camphor, 2 oz.; oil of rosemary, 1 dr. Melt together. Glycerine may be substituted in part for the oil and rose water.

3.—Benzonated Camphor Ice.—Pure lard,  $1\frac{1}{2}$  oz.; spermaceti,  $2\frac{1}{2}$  oz.; camphor, 1 oz.; expressed oil of almonds, 2 oz.; benzoic acid, 6 gr.; oil of cajuput, 10 drops. Melt the lard and spermaceti; dissolve the camphor in the almond oil with gentle heat, and add to the melted fats. When nearly cold, stir in the benzoic acid and oil of cajuput, and pour into molds.

**Camphor Paste.**—Almond oil,  $\frac{1}{2}$  lb.; purified lard,  $\frac{1}{4}$  lb.; wax, spermaceti and camphor, of each 1 oz. Beat up the ingredients as they cool, before pouring out.

**Circassian Cream.**—Fresh mutton suet, 4 oz.; good olive oil, 6 oz.; powdered gum benzoin, 2 oz.; alkanet root,  $\frac{1}{2}$  oz. Put these ingredients in a jar with a cover, and place the jar in a saucepan of boiling water at the side of the fire. Let it digest for 24 hours. Strain away the fluid part through fine muslin, and stir till about cold. Perfume with 2 dr. of essence of roses, almonds, or any perfume desired.

**Cold Creams.**—1.—White wax, 40 grams; spermaceti, 50 grams; bleached expressed oil of mustard, 280 grams; rose water, 160 grams; bleached expressed oil of mustard, 40 grams; borax, 2 grams; rose oil, 12 drops. The wax and spermaceti are dissolved in the expressed oil of mustard by gently warming on a water bath; the mixture is then rubbed down to a fine salve. The borax is next dissolved in the rose water, which has been previously warmed, and is then incorporated with the mass. Finally, the balance of the mustard oil and the rose oil is rubbed up with the above mixture; a remarkably smooth and supple ointment results.

2.—White paraffine oil, 600 grams; white wax, 150 grams; rose water, 240

## Toilet Preparations

### (Cold Cream)

grams; borax, 9 grams; oil of rose geranium, 1 gram; rose oil, 15 drops. The wax is melted in the paraffine oil at about 60° C. The borax is dissolved in the rose water, which has been warmed to about the same temperature. The latter is then poured, in a thin stream, into the former, stirring assiduously, when a white, creamy emulsion results. Finally, incorporate the rose oil and the oil of rose geranium with the cream. The resulting cold cream is white in color, very smooth, and possesses a more fragrant odor, and, in fact, excels the ordinary cream in all respects.

3.—White wax and spermaceti, of each 1 oz.; oil of almonds,  $\frac{1}{4}$  pt. Melt; pour the mixture into a Wedgwood mortar, which has been heated by being immersed in hot water, and add gradually 4 fl.oz. of rose water, stirring until an emulsion is formed, and afterward until the whole is nearly cold. Put in pots. It may be perfumed with bergamot or lavender.

4.—Paraffine, 4 dr.; liquid petrolatum,  $1\frac{1}{2}$  oz.; wool fat, 1 oz.; borax, 7 gr.; rose water, 1 oz. Mix. Melt the paraffine, add the liquid petrolatum, then add the other ingredients.

5.—Wool fat, 20 oz.; white petrolatum, 8 oz.; distilled witch hazel, 6 oz.; tincture of benzoïn, 2 oz.; rose water, 1 oz.; orange-flower water, 1 oz. Mix the lanolin, witch hazel and waters together, then add the benzoïn, and finally the white petrolatum.

6.—Spermaceti, 3 oz.; white wax, 1 oz.; oil of sweet almonds, 8 fl.oz.; borax,  $\frac{1}{2}$  oz.; glycerine, 2 fl.oz.; rose water, 2 fl.oz.; oil of rose, 10 drops; extract of jasmine,  $\frac{1}{2}$  fl.oz. Melt the wax, oil and spermaceti together; dissolve the borax in the glycerine and rose water, previously mixed; pour this solution gradually, and with constant stirring, into the melted mixture until the product assumes a snowy whiteness; then add the perfumes. Dispense in porcelain or glass jars. Pure paraffine wax may be substituted for spermaceti, but it must be in smaller quantity (2 oz. in this formula) and worked very carefully to prevent "granulation."

7.—Oil of almond, 425 parts; lanolin, 185 parts; white wax, 62 parts; spermaceti, 62 parts; borax, 4.5 parts; rose water, 300 parts. Melt together the first four ingredients, then incorporate the solution of borax in the rose water.

8.—Tragacanth, 125 grams; boric acid, 100 grams; glycerine, 140 grams; expressed oil of almonds, 50 grams; glyconine, 50 grams; oil of lavender, 0.5

### (Cold Cream)

gram; water, enough to make 1,000 grams. Mix the tragacanth and the boric acid with the glycerine; add the almond oil, lavender oil and egg glycerite, which have been previously well incorporated, and lastly add the water, in divided portions, until a clear jelly of the desired consistency is obtained.

9.—Oil of almonds, 26 oz.; odorless castor oil, 6 oz.; benzoated lard, 8 oz.; white wax, 8 oz.; rose water (in winter less, in summer more, than quantity named), 12 oz.; orange-flower water, 8 oz.; oil of rose, 15 minims; extract of jasmine, 6 dr.; extract of cassia, 4 dr.; borax, 2 oz.; glycerine, 4 oz. Melt the oil of sweet almond, wax and lard together, and stir in the castor oil; make a solution of the borax in the glycerine and rose and orange-flower waters; add this solution, a little at a time, to the melted fat, stirring constantly, to insure thorough incorporation; finally, add the oil of rose, dissolved in the extracts, and beat the ointment until cold.

10.—Borax.—White wax, 1 oz.; oil of almonds, 4 oz.; rose water, 2 oz.; borax,  $\frac{1}{2}$  dr.; otto of rose, 5 drops. Dissolve the borax in the rose water, and (by the aid of heat) the wax in the oil. While still warm, mix gradually in a mortar, previously warmed. Add the otto, stirring constantly.

11.—Camphorated Cold Cream.—Oil of sweet almonds, 8 fl.oz.; white wax, 1 oz.; spermaceti, 1 oz.; camphor, 1 oz.; rose water, 5 fl.oz.; borax, in fine powder, 4 dr.; oil of rose, 10 drops. Melt the wax and spermaceti, add the oil of sweet almonds, in which the camphor has been dissolved with very gentle heat; then gradually add the rose water, in which the borax has previously been dissolved, beating or agitating constantly with a wooden spatula until cold. Lastly, add the oil of rose.

12.—Cucumber Cold Cream.—Almond oil, 1 lb.; green oil, 1 oz.; juice of cucumbers, 1 lb.; wax and sperm, of each 1 oz.; essence of cucumber, 2 oz.

13.—Dixon's Cold Cream.—White wax, 4 oz.; spermaceti, 4 oz.; white petrolatum, 12 oz.; rose water, 14 oz.; borax, 80 gr. Melt the wax, spermaceti and petrolatum together, over a water bath, dissolve the borax in the rose water and add to the melted mass at one time. Agitate violently. Presumably the borax solution should be of the same temperature as the melted mass. It is important that the direction to add the solution all at once be followed.

14.—Glycerine Cold Cream.—Sperma-

## Toilet Preparations

### (Cold Cream)

ceti, 3 av.oz.; white wax, 1 av.oz.; sweet almond oil, 8 fl.oz.; powdered borax, 240 gr.; glycerine, 3 fl.oz.; orange-flower water, 1 fl.oz.; oil of neroli, 5 drops; oil of rose, 3 drops. Mix as above.

15.—Greaseless Cold Cream.—The following is a greaseless cold cream which is highly recommended: Take stearine, 2 oz.; sodium carbonate,  $\frac{1}{4}$  oz.; borax powder,  $\frac{1}{4}$  oz. With this is mixed 4 fl.oz. of glycerine and about 2 pt. of water; heat over a water bath until there is no further effervescence, then remove, and stir, adding perfumes dissolved in alcohol; almost any perfume may be used. Many like preparations of this kind without any perfume. Oil of rose, ylang-ylang, heliotropine, or oil of bergamot may be used. Some persons, again, do not care for the preparations which contain glycerine, therefore glycerite of starch may be substituted for the glycerine. Quince seed, agar-agar, or tragacanth mucilage, may be added, if desired, decreasing the amount of water. Cocoa butter may, of course, be added, but it is apt to make the formula rather greasy. Witch hazel extract may also be added, if desired, decreasing the quantity of water. This formula will stand a number of modifications for special uses.

16.—Lanolin Cold Creams and Cooling Ointments.—The following are two formulæ suggested by Dr. Unna, the figures in the first column being for ointment and in the second for cream:

	Parts.	
Anhydrous lanolin.....	10	10
Benzoated lard.....	20	20
Rose water.....	30	60

Cooling with lime water, use the same as above, but lime water instead of rose water.

17.—Oriental Cold Cream.—Oil of almonds, 6 oz.; white wax and spermaceti, of each 3 dr.; melt, and add 6 oz. of rose water;  $1\frac{1}{2}$  oz. of orange-flower water. This cream will soften the skin. It should be applied with a cotton or linen cloth.

18.—Paraffine-oil Cold Cream.—White wax, melted, 9 lb.; add white paraffine oil, 4 gal. Continue heating until the liquid clarifies, and pour into a solution of borax,  $\frac{1}{2}$  lb., in distilled water,  $11\frac{1}{4}$  pt. Reapply heat, and stir until snow white; add oil of rose geranium, 3 oz.; stir, and pour into jars.

19.—Petrolatum Cold Cream.—White petrolatum, 7 oz.; paraffine,  $\frac{1}{2}$  oz.; lanolin, 2 oz.; water, 3 oz.; rose oil, 3 drops; alcohol, 1 dr. A small quantity of the

### (Cucumber Cream)

borax may be added, if desirable, and the perfume may be varied to suit the taste.

20.—Pomade.—Anhydrous lanolin, 10 parts; pomade, 20 parts; distilled water, 30 parts. Any suitable perfume pomade may be used, and lime water may take the place of distilled water.

*Cosmetics.*—1.—Simple.—White soft soap,  $\frac{1}{2}$  lb.; olive oil, 3 oz.; melt them together, add of fine sand a small teacupful, and mold or form the mixture into cakes or balls. Shelly sea sand, sifted from the shells, washed, and dried, is the best for this purpose. Used to soften and blanch the hands and to remove roughness and coarseness occasioned by exposure to the weather, or by gardening or other dirty work.

2.—White petrolatum, 100 parts; hard paraffine, 12 parts; borax, in fine powder, 4 parts; tincture of benzoin, 4 parts; zinc oxide, 5 parts; glycerine, 5 parts; perfume, enough. Melt the petrolatum and paraffine on a water bath, and add the borax and the tincture. Stir well for 10 minutes, strain through fine muslin, and allow to cool without further stirring. Rub the zinc oxide with the glycerine, and add to the cooled basis, and beat in a mortar to a uniform consistency, adding the desired perfume.

*Cosmetic Gloves.*—Mock kid or lamb-skin gloves rubbed over, on the inside, with a composition of the following kind: Spermaceti cerate (hardest, melted), 5 oz.; balsam of Peru, 1 dr.; stir for 5 minutes, pour off the clear portion, add of oil of nutmeg,  $\frac{1}{2}$  dr.; oil of cassia, 12 to 15 drops; essence of ambergris, 12 to 15 drops; and stir the whole until cold. Worn by ladies in bed at night, to soften and blanch the hands and to prevent and cure chaps and chilblains.

*Cosmoline Cream.*—Cosmoline, 24 troy oz.; white wax, 12 troy oz.; spermaceti, 12 troy oz.; glycerine, 3 fl.oz.; oil of rose geranium, 1 fl.dr. Melt the wax and spermaceti, add the cosmoline, then stir until nearly cold; add the glycerine and oil, and stir until cold.

*Cucumber Cream.*—Cucumbers are occasionally used in the making of cosmetic "creams," the juice being expressed and used, instead of water, in the "cold cream" formula, or the vegetable is digested with grease until the latter is perfumed, when the product is a pomade. Benzoated lard, 6 lb.; spermaceti, 2 lb.; spirit of cucumber, 1 lb. Melt the spermaceti with the lard, and keep it constantly in motion while it cools; then heat the grease in a mortar, gradually adding the spirit of cucumber; continue to heat until the

## Toilet Preparations

### (Glycerine Cream)

spirit is evaporated and the pomade is beautifully white.

**Cucumber Milk.**—Sweet almonds, 80 parts; fresh cucumber juice, previously boiled, 240 parts; Castile soap, 5 parts; cucumber essence, 60 parts; tincture of benzoin, 1 part.

**Elder-Flower Cream.**—White wax, 2 oz.; spermaceti, 2 oz.; oil of sweet almond, 14 fl.oz.; lanolin, 6 oz. Melt together on a water bath, and stir until nearly cold, gradually adding borax, 75 gr., dissolved in elder-flower water, 9 fl.oz. Perfume with oil of bergamot, 15 minims; oil of rose, 15 minims; oil of neroli bigarade, 10 minims; oil of ylang-ylang, 2 minims; oil of orris, 1 minim; tincture of musk, 5 minims; coumarine,  $\frac{1}{2}$  gr.; vanillin, 3 gr. Mix the oils and add to the melted waxes and oil. Dissolve the coumarine and vanillin in a portion of the oil of almond, and treat likewise. Put in fancy glass or porcelain jars, with handsome label, and tie with ribbon.

**Emollient Tablet.**—An emollient tablet may be made by the appended formula: Mutton suet, 18 oz.; spermaceti, 12 oz.; white wax, 12 oz. Melt together by a gentle heat, remove from the fire, stir well as the mixture begins to cool, continuing until ready to set, when pour into molds. The quantities given above will make from 24 to 26 tablets, if cast in molds of  $1\frac{1}{4}$  to  $2\frac{1}{4}$  in. square and  $\frac{3}{4}$  in. deep; a convenient and desirable size. The best material for the molds is block tin. Their form should be a pan, as indicated in the statement for measurement, the top side entirely open, and they should taper very slightly on the sides from bottom to top. A desirable arrangement is to have them so placed in a tray that they may be surrounded with cold water. The chief use of the tray is to enable the molds to be chilled before casting, which renders adhesion of the tablets much less likely. Much cheaper, though less elegant, molds may be made of tinned iron, and the tray may be dispensed with. The usual way of putting up such a tablet for sale is to wrap it first in thin, smooth paper, then in an outer covering of tinfoil, and lastly to enclose it in a paper box.

**Glycerine.**—1.—Balsam.—This is designed to whiten and soften the skin, remove roughness, chaps, chilblains, and irritations from common causes. Pure white wax, 1 oz.; spermaceti, 2 oz.; oil of almonds, 9 oz. Melt together by a moderate heat in a glazed earthenware vessel, and add best glycerine, 3 oz.; bal-

### (Honey and Almond Cream)

sam of Peru,  $\frac{1}{2}$  oz. The mixture is to be stirred until nearly cold, and then poured into pots. Instead of balsam of Peru, 12 or 15 drops of attar of rose may be employed.

2.—Cream.—This recipe is excellent. Spermaceti, 4 dr.; white wax, 1 dr.; oil of almonds, 2 troy oz.; glycerine, 1 troy oz. Melt the spermaceti, wax and oil together, and when cooling put in the glycerine and perfume.

3.—Heliotrope Glycerine Lotion.—Glycerine, 16 fl.oz.; distilled water, 16 fl.oz.; borax, 2 dr.; extract of white heliotrope, q. s. Mix, and filter. Put up in 3-oz. Blakes, label to cover sides and front, cap with goldbeaters' skin, but pasted on, not tied. In pasting the skin, spread it wet, as for tying, but first apply the brush to the under side of the tip of the bottle, spread, and tie until it dries, and then with a sharp knife trim evenly all around.

4.—Rose Glycerine Cream.—Spermaceti,  $\frac{1}{2}$  oz.; oil of sweet almonds, 2 oz.; white wax, 1 oz.; glycerine, 4 oz. Melt the spermaceti, white wax and oil of almonds together first; then add the glycerine, and stir the mixture until cool. Perfume with attar of rose.

5.—Solidified.—Transparent soap,  $1\frac{1}{2}$  oz.; water, 6 oz.; inodorous glycerine, 36 oz. Dissolve the soap in the water, by heat; add an equal weight of glycerine. When dissolved, add the rest of the glycerine; water, q. s. to make up the weight. When nearly cold, add any perfume desired. Put in glass jars. It is of a pale amber color, and is transparent.

**Honey and Almond Cream.**—1.—Bitter almonds, 1 oz.; yolk of egg, 1 oz.; honey, 1 oz.; oil of sweet almonds, 2 oz.; oil of bergamot, 15 minims; oil of lemon, 12 minims; oil of cloves, 12 minims. Bruise the almonds, previously macerated in cold water, and decorticated, and rub through a fine sieve; then add the essential oils and the mixture of the yolk of egg, honey and sweet almond oil, and beat the whole well until the ingredients have been thoroughly incorporated.

2.—Cold cream, 5 parts; oil of sweet almonds, 5 parts; glycerine, 5 parts; boric acid, 5 parts; solution of soda, 12 parts; mucilage, quince seed (1:8), 25 parts; water, 143 parts; oil of bitter almonds and oil of rose, of each q. s. to perfume. Heat the cold cream, oil and soda solution together, stirring constantly, until an emulsion is formed; then heat together the glycerine, boric acid, mucilage and water, mix with the emulsion, stir until cold, and add enough wa-

## Toilet Preparations

### (Cosmetic Jelly)

ter to make 200 parts; finally add the perfume.

3.—Sweet almonds, blanched, 8 av.oz.; rose water, 32 fl.oz.; alcohol, 4 fl.oz.; oil of rose, 1 fl.dr.; white wax, 240 gr.; spermaceti, 240 gr.; white Castile soap, 240 gr. Shave the soap, place it in a vessel, add several ounces of rose water, and heat on a water bath until dissolved. When the soap is dissolved, add the wax and spermaceti, continue the heat, and stir occasionally. While this is going on blanch the almonds, carefully excluding every damaged particle. Then beat them up in a scrupulously clean mortar, and allow the rose water to trickle into the mass by degrees. When the emulsion of almonds is finished, strain it, without pressure, through clean, washed muslin. The previously prepared saponaceous mixture is now put in the mortar, and the emulsion carefully and gradually blended with it. As the last of the emulsion is run into the mortar the alcohol, in which the oil of rose has been dissolved, is made to follow it, and mixed very gradually with the other ingredients. A too sudden addition of the alcohol frequently coagulates the milk and causes it to be curdled. As it is, the temperature of the mixture rises, and every means must be taken to keep it down. Finally, strain the product. The almond residue may be washed with a few ounces of fresh rose water to prevent any loss in bulk in the whole quantity. The newly formed milk should be allowed to stand at rest for 24 hours, when the clear portion may be drawn off the sediment, and is ready for bottling.

4.—Balsam of Honey.—Take fine pale honey, 4 oz.; glycerine, 1 oz. Mix by a gentle heat; when cold, add alcohol, 1 oz.; essence of ambergris, 6 drops; citric acid, 3 dr. This is intended to remove discolorations and freckles, as well as to improve the general appearance of the skin.

Jelly.—1.—Cosmetic.—Gelatin, 240 gr.; white of egg, 1 av.oz.; salicylic acid, 25 gr.; rose water, 12 fl.oz.; glycerine, enough to make 25 fl.oz. Dissolve the gelatin in the rose water by the aid of the water bath, using a gentle heat. Allow to cool, and before it jellifies add the albumen, and stir together. Mix the salicylic acid with the glycerine, and after again applying heat to the gelatin solution add it to the latter, stirring constantly. When the mixture is quite homogeneous, remove from the fire, and filter, by means of a hot filtration apparatus, directly into receptacles in which it solidifies. Instead of rose water any oth-

### (Witch Hazel Jelly)

er distilled perfumed water, such as orange-flower water, may be used.

2.—Glycerine Jelly for Collapsible Tubes.—Pure transparent soap, 2 dr.; distilled water, 1 fl.oz.; glycerine, 6 fl.oz.; oil of rose, 3 drops. Cut the soap into fine shavings, and dissolve, by a water bath, in the water and 1 oz. of glycerine. When dissolved, add the rest of the glycerine and the oil of rose, and pour into the tubes. A little piece of the jelly should be well rubbed into the hands at bed time, and 2 or 3 times during the day, if they are badly chapped. It may also be used for cracked lips.

3.—Glycerine and Cucumber Jelly.—Gelatin, 160 to 240 gr.; boric acid, 240 gr.; glycerine, 6 fl.oz.; water, 10 fl.oz. Perfume to suit. The perfume must be one that mixes without opalescence, otherwise it mars the beauty of the preparation. Orange-flower water or rose water could be substituted for the water, if desired, or another perfume, consisting of spirit of vanillin (15 gr. per oz.), 2 fl.dr.; spirit of coumarin (15 gr. per oz.), 2 fl.dr.; spirit of bitter almonds ( $\frac{1}{4}$ ), 8 minims; to the quantities given above would prove agreeable.

4.—Glycerine and Honey Jelly.—Glycerine, 4 fl.oz.; clarified honey, 4 fl.dr.; distilled water, 8 fl.oz.; gelatin, 2 dr.; oil of lavender, 12 drops. Soak the gelatin in the water and honey until it softens and swells up; then melt by the aid of heat, and add the glycerine, previously warmed; strain through fine muslin, and when nearly cool add the perfume, and pour into the tubes. Should the preparations be too stiff, they may be thinned down with sufficient glycerine to a suitable consistency.

5.—Glycerine and Starch Jelly.—Starch powder, 4 dr.; glycerine, 2 fl.oz.; distilled water, 2 fl.oz.; solution of cochineal, 5 drops; oil of lavender, 3 drops. Mix the starch, glycerine and water, and heat until a jelly is formed, stirring constantly. Remove from the source of heat, mix in the color, perfume well, and pour into the tubes.

6.—For the Hands.—Tragacanth, white ribbon, 60 gr.; rose water, 14 oz. Macerate for 2 days, and strain forcibly through coarse muslin or cheese cloth; add glycerine and alcohol, of each 1 oz. Perfume to suit. Use immediately after bathing, rubbing in well until dry.

7.—Witch Hazel Jelly.—Powdered tragacanth, 160 gr.; glycerine, 5 oz.; distilled extract of witch hazel, 10 oz.; otto of rose, sufficient quantity. Triturate the tragacanth with the glycerine, add the



## Toilet Preparations

### (Massage Cream)

otto, and then the distilled extract of witch hazel.

**Lanolin Milk.**—Melt anhydrous lanolin, 100 grams; and add glycerine, 100 grams; water, 750 grams. Put in a wide-necked bottle vessel and add, with continued violent shaking: Tincture of benzoin, 50 grams; mucilage, 30 grams; and perfume like the *crème*. Preparations which have been introduced years ago for the care of the skin and complexion are the glycerine gels, which have the advantage over lanolin that they go farther, but present the drawback of not being so quickly absorbed by the skin. These products are filled either into glasses or into tubes. The latter way is preferable, and is more and more adopted owing to the convenience of handling. A good recipe for such a gelée is the following: Moisten white tragacanth powder, 50 grams, with glycerine, 200 grams, and spirit of wine, 100 grams, and shake with a suitable amount of perfume; then quickly mix, and shake with warm distilled water, 650 grams. A transparent slime will form immediately, which can be drawn off at once.

**Lanolin Toilet Crème.**—Anhydrous lanolin, 650; peach-kernel oil, 200; water, 150. Perfume with about 15 drops of ionone or 20 drops of synthetic ylang-ylang.

**Massage Cream.**—Preparations for massaging the skin usually depend upon a fatty base, and any bland ointment of the "cold cream" series will answer the purpose. These massage creams are also known as "skin foods," and the formulas for these are numerous. Lanolin is a popular addition, as it aids in holding a large percentage of water incorporated in the product. The addition of an alkali or alkaline salt, previously dissolved in the water, adds to the softening effect on the skin, which seems to be the object desired; almond or rose are the popular perfumes, while the color is that of pink. The anhydrous lanolin is known as *oleum lanæ*, or *lanum*. When the ordinary lanolin is employed, the amount of water must be reduced in the formulas.

1.—Lanolin, anhydrous, 3 av.oz.; benzoated lard, 6 av.oz.; water, 9 fl.oz.; borax, 60 gr. Melt the lard and lanolin together; dissolve the borax in the water, warming the same slightly, and add to the melted fats, with stirring, until cool; perfume and color.

2.—Petrolatum oil, 8 av.oz.; lanolin, anhydrous, 4 av.oz.; white wax, 1 av.oz.; spermaceti, 1 av.oz.; borax, 60 gr.; water, 6 fl.oz. Melt together the first four

### (Massage Cream)

ingredients, then incorporate the water, after which perfume and color.

3.—White wax, 1 av.oz.; spermaceti, 1 av.oz.; sweet almond oil, 7 av.oz.; lanolin, anhydrous,  $3\frac{1}{2}$  av.oz.; borax, 5 fl.oz.; water. Melt the wax and spermaceti, add the lanolin and oil, and, when melted, add the water containing the borax in solution; stir together until cold, and add suitable perfume and color.

4.—White petrolatum, 14 av.oz.; paraffine wax, 1 av.oz.; lanolin, anhydrous, 4 av.oz.; water, 6 fl.oz.; powdered borax, 60 gr. Melt the petrolatum and paraffine on a water bath, pour into a warm mortar, add the lanolin, and, with constant stirring, incorporate the water; when of the consistency of a thick cream add the perfume and color.

5.—White petrolatum, 10 av.oz.; lanolin, anhydrous, 5 av.oz.; powdered borax, 60 gr.; water, 5 fl.oz. Mix the petrolatum, lanolin and soap, incorporate the water with this mixture, and then perfume and color.

6.—Lanolin, anhydrous, 8 av.oz.; white petrolatum oil, 2 av.oz.; powdered borax, 60 gr.; powdered starch, 2 av.oz.; water, 4 fl.oz. Melt the lanolin, and add the petrolatum; place the borax and water in a bottle of double capacity, add the starch, and after thoroughly shaking together, add to the liquefied fats, with stirring, until cold; then add perfume and color.

7.—Milk, skimmed free from fat, 2 gal.; powdered borax, 1 oz.; boric acid,  $1\frac{1}{2}$  oz.; pulverized alum, 4 oz.; carmine coloring, q. s.; perfume, q. s. Dissolve the borax, acid, alum, coloring and perfume in some water, add to the milk, and set on a fire, being careful not to burn or scald the milk. After the casein is precipitated, or the whey shows clear, strain through cheese cloth. Do not let it get too dry. Then put in the ariemulsifier and beat up. This fluffs it up, breaks up all the granular particles of casein, and makes a beautifully smooth cream. If too thick, a small quantity of boiled water can be added, and the whole can then be beaten again in machine.

8.—Skimmed milk, 2 pt.; powdered alum, 6 dr.; boric acid, 4 dr.; borax, 6 dr.; 95% phenol, 6 drops; oil of rose geranium, q. s.; oil of bitter almond, q. s.; solution of carmine, q. s.; water, q. s. Heat the milk to 130° F.; add the alum to 1 oz. of water, and heat to the same temperature; add the boric acid to  $2\frac{1}{2}$  oz. of water and apply the same degree of heat; mix the milk and the boric solution, while warm, and add the alum

## Toilet Preparations

### (Skin Foods)

solution, also warm. After the milk has curdled, strain it, and if not clear add more alum solution; when all the casein has been gathered add the phenol and q. s. of oils to perfume and a little carmine to tint.

9.—White potash soap, shaved, 20 parts; glycerine, 30 parts; water, 30 parts; 90% alcohol, 10 parts. Dissolve the soap by heating it with the glycerine and water, mixed. Add the alcohol, and for every 3 oz. of the solution add 5 or 6 drops of the *Mistura oleoso-balsamica*, German Pharmacopoeia (which you will find in the dispensaries). Filter while hot.

10.—Special Massage Base (Skin Food).—Snow-white cold cream, 4 oz.; lanolin, 4 oz.; oil of theobroma, 4 oz.; white petrolatum oil, 4 oz.; distilled water, 4 oz. In hot weather, add spermaceti, 1½ dr.; white wax, 2½ dr. In winter the two latter are left out, and the proportion of cocon butter is modified. Prepared and perfumed in proportion same as cold cream. This is prescribed and recommended by Dr. Sands, the great New York skin and scalp specialist.

*Skin Foods.*—Owing to the belief that lanolin is more readily absorbed by the skin than are some other ointment bases, many prefer it as the base for skin foods; the other ingredients generally being simply to perfume the base, and perhaps to give it a more attractive color. A report of a physician says that he has given small vials of cod liver oil, suitably perfumed, to patients who ask him for something to remove wrinkles from their faces and restore the plumpness and bloom, and that the results were satisfactory. Perhaps the massage has something to do with the case, independent of any direct action of the "food." To prepare casein extemporaneously, for use as a skin food, place the skimmed milk in a shallow dish, set aside in a warm place until it coagulates, then heat to 120°, and strain the whey, wash with cold water, and press as dry as possible. To prepare it even more quickly, precipitate it from milk with acetic acid or vinegar, and, after heating, proceed as just outlined.

1.—Pure lard, 8 oz.; veal suet, 8 oz.; olive oil, 1½ oz.; compound tincture of benzoin, 4 dr. Melt together the lard, suet and oil, and as they cool stir in the tincture.

2.—Rough skin is to be washed constantly in vichy water. Besides this, rough places are to have the following

### (Toilet Cream)

applications, twice daily, either a few drops of—

a.—Rose water, 100 parts; glycerine, 25 parts; tannin, ¾ part. Mix.

b.—Orange-flower water, 100 parts; glycerine, 10 parts; borax, 2 parts. Mix. Sig.: Apply twice daily.

3.—White petrolatum, 7 oz.; paraffine wax, ½ oz.; lanolin, 2 oz.; borax, 30 gr.; rose water, 3 oz. Melt the wax, add the petrolatum and lanolin, pour into a warm mortar, and, with constant stirring, incorporate the rose water, in which the borax previously has been dissolved. This preparation may be tinted red by means of alkanet root suspended in the melted mixture, ere the water is added.

4.—Castor oil, 6 oz.; alcohol, 10 oz.; oil of lavender, 2 dr.; oil of bergamot, 1 dr. Mix. This can be tinted by carmine.

*Snow Cream.*—Spermaceti, 4½ oz.; white wax, 3 oz.; fresh oil of almonds, 18 oz.; melt over a water bath; pour in a marble mortar, and stir briskly to prevent granulation. When the mixture becomes of the consistency of butter, triturate until it has a white, creamy appearance; add gradually a mixture of double water of roses, 1½ oz.; odorless glycerine, 1½ oz.; mix for 20 minutes, then add 15 drops of essence of roses; beat for about half an hour.

*Toilet Cream (Marshall).*—Quince seed, 180 gr.; boric acid, 20 gr.; glycerine, 5 fl.oz.; alcohol, 5 fl.oz.; carbolic acid, 1 fl.dr.; oil of bitter almond, 15 drops; glycerite starch, 5 av.oz.; tincture of benzoin, ½ fl.dr.; almonds, 3 oz.; aq. dist., q. s. to make 48 oz. Blanch the almonds, and beat to a pulp, with about 18 to 20 oz. of water; macerate the quince seed in water for several hours, strain, and mix with the glycerite starch and glycerine, in which the boric and carbolic acids have been dissolved; add the tincture of benzoin, drop by drop, to about 1 pt. of water, and add to above; dissolve the oil of almond in the alcohol, and mix all thoroughly; strain through muslin, and add enough water to make 48 oz.

*Witch Hazel Snow.*—Stearic acid, 60 grams; sodium carbonate, 9 grams; glycerine, 7 grams; hamamelis water, 300 grams; water, enough. Melt the stearic acid in a tared vessel of about 2,000 c.c. capacity, over a water bath, and add the sodium carbonate, dissolved in a minimum amount of hot water; then add the glycerine. Keep the mixture on the water bath for one hour, stirring constantly, but not vigorously; add sufficient water

## Toilet Preparations

### (Court Plaster)

to bring the preparation up to 300 grams, and then the hamamelis water. Return the container to the water bath for a minute or two, stirring the mixture until perfectly smooth. Pour into a warm mortar, and beat to a foam. Let it stand 12 hours, stir with a spatula, and fill into wide-mouthed bottles.

#### Court Plaster.

1.—Goldbeaters' skin, without any preparation, forms the very best court plaster that can be employed. A piece of it applied dry to the slightly moistened skin, and held there for a few seconds with the hand, will adhere firmly for several days, or until the part be wetted; and, from being transparent, and almost colorless, will, when of the finest quality, and skilfully applied, be scarcely visible.

2.—Best genuine isinglass, 1 oz.; water,  $\frac{1}{2}$  pt. Dissolve by heating them together in a covered vessel; strain the solution, and when only lukewarm add to it, gradually, but quickly, a mixture formed of rectified spirit, 2 fl.oz.; tincture of benzoin, 2 fl.oz. Apply this composition (still warm) by means of a flat camel's-hair brush, or any appropriate "spreader," to the surface of silk, or sarsenet, stretched in a frame, repeating the application as soon as the preceding coating is dry, and again as often as necessary (6 to 12 times). Lastly, when quite dry and hard, give the prepared surface a "finishing coat" with a solution of Chio turpentine, 1 oz., dissolved in tincture of benzoin, 2 fl.oz. Tincture of balsam of Peru, or of styrax, may be substituted for the tincture of benzoin; and a few drops of essence of ambergris, or of musk, may be added to increase the fragrance of the compound. Some parties simply employ one or other of the above tinctures for the finishing coat, and others apply it to the unprepared side of the silk, by which the plaster is rendered partially waterproof, but the appearance of its exposed surface injured. Care should be taken that the first 2 or 3 applications of the gelatine composition do not sink into the silk, so as to appear on the right side, which will not be the case if it be only sufficiently warm to remain liquid, and be applied very thinly and rapidly, and with a light stroke of the brush or spreader.

3.—*Deschamp's*.—Apply to stretched silk a very thin coating of smooth, strained flour paste; and over this, when dry, 2 or 3 coats of warm size, made with colorless gelatine and water, to which some odorous tincture or essence

### (Court Plaster)

has been added. Said to be superior to the ordinary court plaster, and much of the court plaster of commerce is so prepared.

4.—*Liston's*.—Isinglass, 1 oz.; water,  $2\frac{1}{2}$  oz. Keep them in a covered vessel, in a hot place, until the isinglass has swollen, and absorbed all the water and become quite soft; then beat it to a uniform semi-fluid mass, strain it by squeezing it through muslin, and add of proof spirit,  $3\frac{1}{2}$  fl.oz. Next expose the mixture, with frequent stirring, in a covered bottle or other vessel, until the union be complete. Lastly, with a brush apply 4 coats of the solution to the surface of oiled silk, stretched out and nailed on a board. A little of the tinctures or essences before noticed may be added to impart a slight odor to the plaster.

5.—Soak isinglass in a little warm water for 74 hours, then evaporate nearly all the water by gentle heat, dissolve the residue in a little proof alcohol, and strain the whole through a piece of open linen. The strained mass should be a stiff jelly when cool. Now stretch a piece of silk or sarsenet on a wooden frame, and fix it tight with tacks or pack thread. Melt the jelly, and apply it to the silk thinly and evenly with a badger-hair brush. A second coating must be applied when the first has dried. When both are dry, apply over the whole surface 2 or 3 coatings of balsam of Peru. Plaster thus made is said to be very pliable, and never breaks.

6.—Court plaster should be thoroughly soaked on both sides before it is applied, and should be pressed on with a soft, dry cloth. Then it will adhere so firmly that washing with soap and water will hardly remove it.

7.—a.—Black silk or sarsenet is strained, and brushed over 10 or 12 times with the following composition. Balsam (gum) of benzoin,  $\frac{1}{2}$  oz.; 90% alcohol, 6 oz.; dissolve. In a separate vessel dissolve 1 oz. of isinglass in as little water as possible; strain each solution, mix, and decant the clear. It is applied warm. When the last coat is quite dry, a finishing coat must be given with a solution of 4 oz. of Chio turpentine in 6 oz. of tincture of benzoin.

b.—Isinglass, 1 oz.; dissolve in proof spirit, 12 oz.; add tincture of benzoin, 2 oz.; give 5 or 6 coats, and finish off as last.

c.—Isinglass, 1 oz.; water, 3 oz.; dissolve; add tincture of benzoin, 1 oz.; apply as above, and finish off with a coat of tincture of benzoin or tincture of bal-

## Toilet Preparations

### (Foot Powders)

sam of Peru. Goldbeaters' skin is now frequently substituted for sarsenet.

8.—*Liquid Court Plaster*.—Pyroxilin, 1 oz.; amyl acetate, 5 oz.; acetone, 15 oz.; balsam of fir, 2 dr.; castor oil, 2 dr.; oil of cloves, 15 minims. Dissolve the pyroxilin in the amyl acetate and the acetone, and add the other ingredients, avoiding fire or light.

### Depilatories.

1.—*Liquid Depilatory*.—Here is a formula from *Monatsschr. für Dermatologie*, and recommended by Dr. Butte: Alcohol, 12 grams; iodine, 0.75 gram; colloidal, 35 grams; oil of turpentine, 1.50 grams; castor oil, 2 grams. Apply to the part from which the hair is to be removed one or twice daily for 3 or 4 successive days, increasing from day to day the thickness of the layer.

2.—Sodium sulphide, crystallized, 3 parts; powdered quicklime, 10 parts; powdered starch, 10 parts.

3.—Powdered quicklime, 1 part; sodium carbonate, 2 parts; lard, 8 parts. Apply, and remove after 2 or 3 minutes.

4.—Barium sulphide, powdered quicklime, powdered starch, equal parts.

5.—Powdered quicklime, 8 parts; potassium carbonate, 1 part; potassium sulphide, 1 part. This is known as "Chinese Depilatory," and, when finely powdered, should be kept in a well closed bottle.

6.—Quicklime, 120 gr.; sodium sulphide, 240 gr.; starch, 80 gr.; powdered orris root, 40 gr. Rub the necessary portion of this powder into a thin paste with water, and apply as directed for No. 1.

### Foot Powders.

All the most prominent brands were found to contain talcum in the proportion of 75 to 90%. The starch is mostly in the form of corn, wheat or potato starch, only one sample containing powdered orris root. Salicylic acid is used in the proportion of 3 to 7.5%, as a rule, and boric acid varied from 1 to 75%. The purpose of borax in these powders is to control germ action, and one of the most popular brands contains it in considerable proportion. Following is the composition of some of the leading brands:

- 1.—Talcum, 75%; boric acid, 25%.
- 2.—Talcum, 12.5%; starch, 50%; borax, 37.5%.
- 3.—Talcum, 25%; boric acid, 75%.
- 4.—Talcum, 65%; alum, 20%; magnesia, 15%.
- 5.—Talcum, 90%; borax, 10%.

### (Freckles and Tan)

6.—Talcum, 95%; alum, 4%; boric acid, 1%.

7.—Starch, 65%; zinc oxide, 35%.

8.—Talcum, 60%; boric acid, 40%.

9.—Talcum, 75%; starch, 15%; salicylic acid, 7.5%; alum, 2.5%.

10.—Zinc oxide, 25%; borax, 75%.

11.—Starch, 75%; salicylic acid, 25%.

12.—Boric acid, in fine powder, 4 oz.; powdered alum, 4 oz.; powdered French chalk, 24 oz. Perfume may be added, if desired.

13.—Salicylic acid, 7 dr.; boric acid, 2 oz. 440 gr.; talcum, 38 oz.; slippery-elm bark, 1 oz.; orris root, 1 oz.

14.—Salicylic acid, 1 av.oz.; alum, 2 av.oz.; starch, 8 av.oz.; talcum, 28 av.oz.; alcohol, 2 fl.oz.; oil of bergamot, 1 fl.dr.

15.—Zinc oxide, 8 av.oz.; starch, 11 av.oz.; talcum, 60 av.oz.; salicylic acid, 1 av.oz.; oil of wintergreen, 30 minims.

16.—Sodium salicylate, 1 oz.; potassium permanganate, 3 oz.; talcum, 40 oz.; bismuth subnitrate, 45 oz.

17.—Tannoform, 1 part; powdered orris root, 1 part; powdered talcum, 8 parts.

18.—Powdered borax, 1 part; salicylic acid, 1 part; powdered boric acid, 1 part; powdered starch, 12 parts.

19.—Formaldehyde, 0.13 gr.; thymol, 0.10 gr.; zinc oxide, 34.44 gr.; starch, 65.27 gr. It seems that the formaldehyde must be in chemical union with some one of the ingredients in order not to become dissipated.

20.—For severe cases of bromidrosis of the feet it is well to soak the stockings in a concentrated solution of boric acid, and drying, putting on a fresh pair every morning. The feet should be bathed every evening, in hot water, quickly dried, alcohol applied, and this also quickly dried off.

21.—*Antiseptic Powder*.—a.—Powdered boric acid, 1 oz.; powdered orris root, 1 oz.; powdered starch, 1 oz.; powdered zinc oxide, 1 oz.; oil of eucalyptus, 1 fl.dr. Mix.

b.—Boric acid, 10 oz.; exsiccated alum, 10 oz.; fuller's earth, 2½ lb.; powdered starch, 1¼ lb.; powdered talc, 20 oz.; zinc oxide, 10 oz.; oil of eucalyptus, 2 fl.oz. Mix.

### Freckles and Tan.

*Lanoderma*.—For moth, tan and freckles.—Precipitated sulphur, 10 parts; zinc oxide, 5 parts; sweet almond oil, 10 parts; hydrated wool fat, 10 parts. Melt the wool fat and oil together, and add the sulphur and zinc oxide. Remove from the fire, and let cool under constant stir-

## Toilet Preparations

### (Hair Preparations)

ring. Just before it begins to set add any desired perfume.

**Lotion.**—Borax, 2 av.oz.; potassium chlorate, 1 av. oz.; glycerine, 4 fl.oz.; alcohol, 2 fl.oz.; rose water, 10 fl.oz. Mix the borax and chlorate of potassium with the glycerine and rose water; when as much as possible is dissolved of the salts add the alcohol, and filter. Apply with a soft sponge several times a day.

**Removal of Tan, Freckles, etc.**—1.—A preparation described as "Jour d'Ete," is made with the following formula: Precipitate sulphur, 2 parts; zinc oxide, 1 part; lanolin, 2 parts; oil of amygd., 2 parts. This is perfumed according to taste.

2.—Hydrogen peroxide has been recommended as a face bleach, and is perhaps as harmless as any. An experiment would soon demonstrate its virtue or harmfulness, as the case might be. If the skin became sore or irritated under treatment, a little warm boric acid and water and glycerine should be applied.

3.—Buttermilk, or sour milk, 2 oz.; grated horseradish, 2 dr.; corn meal, 6 dr. Spread this mixture between thin muslin and allow it to lie on the affected parts as long as possible at night, care being used to keep it away from the eyes.

4.—Bismuth subnitrate, 4 dr.; glycerine, 4 dr.; hydrous wool fat, 3 oz.

5.—Ammonium chloride, 1 oz.; hydrochloric acid, c. p., 1 oz.; glycerine, 4 oz.; elder-flower water, to make 4 pt.

6.—Solution of chlorinated soda, 2 oz.; hydrochloric acid, c. p., 4 dr.; ammonium chloride, 4 dr.; glycerine, 2 oz.; elder-flower water, 4 oz.; perfume, enough.

7.—Zinc sulphocarbonate, 2 dr.; glycerine, 5 oz.

### Hair.

**Bandoline.**—1.—Quince seed, 2 dr.; water, 1 pt.; alcohol, 1 oz.; cologne water, 1 oz.; oil of cloves, 6 drops. Gently boil the quince seed in the water until it is evaporated to 12 oz.; strain through muslin, and when the mucilage is nearly cold, add the alcohol, cologne and oil.

2.—Gum tragacanth, 2 dr.; water, 8 oz.; glycerine, 1 oz.; oil of rose, 5 minims; ammoniacal carmine solution, a sufficient quantity. Add the water to the tragacanth, and when it has become soft add the glycerine and rose oil, previously mixed, and color to suit. The perfume can be varied, or the color omitted, according to fancy. Rose, almond and orange are the odors usually preferred for bandolines.

**Bleaching Hair with Hydrogen Perox-**

### (Hair Preparations)

*ide.*—1.—For bleaching hair upon the head, the hair is previously washed, to remove all grease, and the peroxide of hydrogen applied rapidly, care being taken not to touch the skin more than is unavoidable. By this operation, yellowish tints are produced, which, if carried too far, are likely to turn the hair gray. Applications of this nature may be expected to be injurious to the hair.

2.—For bleaching human hair not upon the head: Mix 1 lb. of hydrogen peroxide with 1 oz. of water of ammonia; mix 4 oz. of hydrogen peroxide with 1 oz. of cream of tartar, dissolved in 1 oz. of soda. Blend the two solutions, and steep 1 lb. of the hair in it for 3 hours. Then wash in clean water, with soap, in a bath of clay, and thoroughly dry. Repeat the process 15 or 16 times, but thoroughly mix and shake up the hair after the 12th and every succeeding time.

**Brilliantine.**—1.—Suet, 40 oz.; wax, 40 oz.; sesame oil, 40 oz. Melt in a water bath, and under assiduous stirring, so as to make a foamy mixture; add castor oil, 21 oz.; tragacanth mucilage, 20 oz. The last ingredient must be a thick preparation, made with rose water.

2.—Alcohol, 60%; 4 oz.; castor oil, 2 oz.; neroli oil, 20 minims; oil of rose geranium, 5 minims; oil of verbena, 5 minims; oil of lemon, 50 minims. Color yellow with saffron.

3.—Alcohol, 90%, 3 oz.; castor oil, 2 dr.; almond oil, 1½ oz.; glycerine, 4 dr.; extract of jockey club, 1 dr. Mix.

4.—Lard, 3½ oz.; spermaceti, 3½ oz.; almond oil, 3½ oz.; wax, 1 oz. Mix.

**Curling Fluid, or Curlique.**—1.—Borax, 3 oz.; gum arabic, 1 dr.; hot water, 2 pt.; spirit of camphor, 2½ fl.oz. Dissolve the borax and the gum in hot water, and when nearly cool add the spirit of camphor. On retiring at night wet the hair with the above liquid.

2.—Gum arabic, 1 dr.; sugar, 1 dr.; rose water, 2 oz. Mix, and dissolve. Moisten the hair with the solution at bedtime; roll in twists or paper, so as to make papillotes.

**Dandruff.**—1.—Salicylic acid, 25 gr.; glycerine, 1 fl.dr.; dilute alcohol, 2 fl.oz.; oil of wintergreen, 3 minims; oil of rose, 1 minim; oil of neroli, 1 minim; water, 4 fl.oz. Mix the acid and oils with the alcohol and glycerine, add the water, and filter.

2.—Betanaphthol, 6 dr.; glycerine, 2 fl.dr.; oil of wintergreen, ½ fl.dr.; oil of rose, 10 minims; oil of neroli, 10 minims; terpeneol, 10 minims; oil of orris, 5 minims; heliotropine, 1½ gr.; tincture of

## Toilet Preparations

### (Hair Preparations)

quillaja, 30 f.oz. Wash the hair, dry it, apply the above lightly, with a sponge, tie a cloth over the head, and allow it to remain for half an hour.

3.—Lotion.—Resorcin, 1 dr.; castor oil, 2 dr.; balsam of Peru,  $\frac{1}{4}$  dr.; oil of geranium, 10 minims; oil of lavender, 10 minims; alcohol, 45%, enough to make 8 oz.

4.—Pomade.—Benzoated lard, 120 parts; precipitated sulphur, 4 parts; lanolin, 20 parts; 90% alcohol, 20 parts; salicylic acid, 1 part; oil of geranium, 1 part; rose water, 60 parts. Melt the fats together, add the sulphur, and stir in. Remove from the fire, and add the alcohol, in which the salicylic acid and oil have been previously dissolved. Finally, add, a little at a time, and under constant stirring, the rose water. Continue stirring until cold.

*Dye.*—Nitrate of silver dyes should be avoided, and the use of any dye for a prolonged time is detrimental to the hair.

1.—Aureol, a Harmless Hair Dye.—The dye consists of two liquids, used in equal parts. The first is a 3% solution of hydrogen peroxide. The second consists of metol, 10 parts; amidophenol hydrochlorate, 3 parts; monamidophenylamin, 6 parts; sodium sulphite, 5 parts; alcohol, 500 parts. Dissolve the sodium sulphite in the alcohol, and add the rest of the chemicals. In use, equal parts of the two liquids are taken, and only as much as is necessary at the time should be mixed. The hair is first freed from grease, etc., by washing with plenty of soap, and thoroughly rinsing; and, after drying, the dye is applied with a comb having fine teeth.

2.—Black.—(a) Sulphate of iron, 10 gr.; glycerine, 1 oz.; water, 1 pt. The hair must be thoroughly washed with this, dried, and brushed once daily for 3 days; then the following should be applied, on a small-toothed comb, but it should not be allowed to touch the skin if the other preparation has done so, as a temporary stain would result: (b) Gallic acid, 4 gr.; tannic acid, 4 gr.; water, 1½ oz. After the first application of formula (a) the hair should be allowed to dry, and then be brushed. Subsequently, both formulas may be used once daily, at an interval of an hour or so, until a black color is produced. All preparations of lead and mercury are injurious. If used for any length of time; they may, however, be legitimately used where some small portion of hair has, from personal idiosyncrasy, lost its color, which cannot be restored. Non-injurious.

### (Hair Preparations)

3.—Brown.—a.—Walnut skins, beaten to a pulp, 4 oz.; rectified spirit, 16 oz. The above is perfectly innocuous in its character.

b.—Bismuth subnitrate, 200 gr.; water, 2 f.oz.; nitric acid, sufficient to dissolve, or about 420 gr. Use heat to effect solution. Also tartaric acid, 150 gr.; sodium bicarbonate, 168 gr.; water, 32 f.oz. When effervescence has ceased, mix the cold liquids by pouring the latter into the former, with constant stirring. Allow the precipitate to subside; transfer it to a filter or strainer, and wash with water until free from the sodium nitrate formed.

4.—Hair and Whisker Dye.—The following formula has frequently been published, for instantaneously dyeing the hair black with one treatment: (a) Pyrogalllic acid, 1 dr.; alcohol, 4 dr.; distilled water, 4 f.oz. (b) Silver nitrate, 1 dr.; ammonia water, enough; distilled water, enough to make 1 f.oz. After dissolving the silver nitrate in 4 f.oz. of distilled water, gradually add water of ammonia, stirring constantly, until the brown turbidity produced has vanished and the liquid is colorless. Then add enough distilled water to make 1 f.oz. Excess of ammonia must be avoided, as that tends to produce a brownish dye. The hair must have been cleaned with sodium carbonate and hot water, and dried. Solution (a) is first applied, and then, while yet moist, solution (b), being careful not to stain the skin.

5.—Chestnut.—Bismuth nitrate, 230 gr.; tartaric acid, 75 gr.; water, 100 minims. Dissolve the acid in the water, and to the solution add the bismuth nitrate, and stir until dissolved. Pour the resulting solution into 1 pt. of water, and collect the magma on a filter. Remove all traces of acid from the magma by repeated washings with water, then dissolve it in ammonia water, 2 f.dr.; and add glycerine, 20 minims; sodium hyposulphite, 75 gr.; water, enough to make 4 f.oz.

6.—Vegetable Hair Dye.—a.—An infusion of henna leaves (*Lawsomia inermis*) is made, then strained, and the liquor evaporated so as to represent 1 in 8, to which 2 f.oz. of alcohol are added, and filtered through paper. This is said to produce an auburn brown color; if it is to be a darker shade, add ammonia.

b.—A formula for a walnut hair oil or dye is the following: Green walnut shells, 2 av.oz.; alum,  $\frac{1}{4}$  av.oz.; cottonseed oil, 4 av.oz. Heat together in a water bath until the water has been expelled; then express, filter through paper, and perfume.

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### (Hair Preparations)

*Falling of the Hair.*—1.—Tincture of cinchona, 1 part; tincture of rosemary, 1 part; tincture of jaborandi, 1 part; castor oil, 2 parts; rum, 10 parts.

2.—Deodorized petroleum, perfumed by adding 2 drops of perfume to each ounce. A little should be rubbed into the scalp night and morning.

*Mustache Firing Fluid.*—1.—Balsam of tolu, 1 part; rect. spirit, 3 fluid parts; perfume. Dissolve the balsam in the mixture. Put up in small bottles, with a brush attached to cork. Apply a few drops to the mustache with the brush, then twist into the desired shape.

2.—Hungarian Mustache Wax.—Spermaceti, 5 parts; wax, 20 parts; water, 50 parts; gum arabic, 15 parts; soap, 10 parts; glycerine, 5 parts. The soap is finely shaved, and the gum arabic pulverized; both are then stirred up with 20 parts of water to a homogeneous paste. The spermaceti and wax are heated with the remainder of the water, on a water bath, and stirred carefully into the gum and soap paste. Lastly, the glycerine is added, drop by drop. Perfumery is added to suit the taste, and if a brown color is desired, amber is mixed with the glycerine, for black, lampblack.

*Oils.*—1.—Cocoanut oil, 4 fl.oz.; castor oil, 3 fl.oz.; alcohol, 7 fl.oz.; oil of lavender flowers, 1 fl.dr.; oil of bergamot, 30 drops; oil of rose geranium, 10 drops. Melt the cocoanut oil, and add to the castor oil, dissolved in the alcohol. Shake well together, and add the essential oils. When cool, this acquires a crystalline appearance.

2.—Castor oil, 15 fl.oz.; alcohol, 3 fl.oz.; oil of nutmeg, 30 drops; oil of rosemary, 10 drops; oil of sweet marjoram, 10 drops; oil of neroli, 10 drops; oil of rose, 20 drops; tincture of musk, 1 fl.dr.; alcanet, q. s. to color.

3.—Nursery Hair Oil.—a.—Phenol, 1 oz.; alcanet root, a sufficient quantity to color suitably, 19 oz.; olive oil. Macerate and strain.

b.—Oil of stavesacre, 1 fl.dr.; olive oil, 7 fl.dr. Mix.

*Philocome, Friend to the Hair.*—1.—White wax, 10 oz.; fresh rose oil, 1 lb.; anacia oil, ½ lb.; jasmine oil, ½ lb.; fleur d'orange oil, 1 lb.; tuberose oil, 1 lb. Melt the wax in the oils by a water bath at the lowest possible temperature. Stir the mixture as it cools; do not pour out until it is nearly cool enough to set. Let the jars be slightly warmed.

2.—Philocome, second quality.—White wax, 5 oz.; almond oil, 2 lb.; otto of ber-

### (Hair Preparations)

gamot, 1 oz.; otto of lemon, ½ oz.; otto of lavender, 2 dr.; otto of cloves, 1 dr.

*Resorcin Hair Restorer.*—1.—Resorcin, 1 dr.; spirit of rosemary, 3 oz.; tincture of nux vomica, 1 oz.; alcohol, 2 oz. Apply to the scalp.

2.—Resorcin, 1½ dr.; tincture of capsicum, ½ oz.; tincture of quillaja, 1 oz.; glycerine, 2 dr.; tincture of cantharides, 3 dr.; spirit of rosemary, 1½ oz.; rose water, to make 8 oz. Use on hair night and morning.

*Shampoos.*—1.—Almond oil, 4 dr.; ammonia water, 10%, 6 dr.; spirit of rosemary, 1½ oz.; eau de cologne, 1½ oz.; tincture of saffron, 2 dr. Mix the oil and ammonia, shaking well, and then add the other ingredients. To be shaken before use.

2.—Ammonia water, ½ oz.; tincture of cantharides, ½ oz.; cologne water, 1 oz.; water, enough to make 8 oz. Apply to the scalp with a sponge, morning and evening.

3.—Tincture of capsicum, ½ oz.; tincture of soap-tree bark, 1 oz.; glycerine, 2 dr.; tincture of cantharides, 3 dr.; spirit of rosemary, 1½ oz.; rose water, enough to make 8 oz.

4.—Borated Shampoo.—Potassium carbonate, 1 oz.; borax, 1 oz.; water, 2 pt.

5.—Egg Shampoo.—a.—Spirit soap, 100 grams; ammonia water, 10 grams; oil of lemon, 3 grams; oil of rose geranium, 1 gram; water, 810 grams; yolks of 4 eggs. Intimately mix, by beating, the egg yolks with the ammonia water; add the water and perfume; shake the mixture, and strain.

b.—Eggs, 3; spirit soap, 4 fl.dr.; potassium carbonate, 160 gr.; ammonia water, 160 gr.; cumarin, 1-10 gr.; oil of rose, 2 drops; oil of bergamot, 2 drops; oil of geranium, 1 drop; essential oil of almonds, 1 drop; rose water, 27 fl.oz. Thoroughly beat the eggs, and dilute with the rose water; then add the other ingredients. If it is desired to have the shampoo in paste form, use less water.

6.—Eucalyptic Shampoo.—Glycerine of borax, 2 oz.; esprit menthol, 2 oz.; solution of ammonia, 3 oz.; extract of roses, 3 oz.; fluid extract of quillaja, 5 oz.; esprit eucalyptus, 10 oz.; French rose water, 15 oz. Mix. Allow to stand 24 hours, then filter.

7.—Green Soap.—A liquid shampoo containing green soap may be prepared according to the following formula: Green soap, 24 grams; potassium carbonate, 5 grams; alcohol, 48 grams; water, q. s. to make 400 grams. The liquid is to be perfumed as the compounder may desire. It

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is advisable to tint the liquid a pale green with a very small quantity of aniline green. The hair is to be thoroughly moistened with warm water, and a small quantity of the shampoo is then rubbed in. The abundant foam which forms is washed out with plenty of water.

8.—**Lanolin Hair Wash.**—For a hair wash, which constitutes a substitute for the well-known "Javal" preparation, and excels the latter in appearance as well as by the use of a more suitable fat, which does not turn rancid. The following receipt is given: Extract 4 parts of quillaya bark with 36 parts of water for several days, mix the percolate with 4 parts of alcohol, and filter after having settled. Agitate 40 parts of the filtrate at a temperature at which wool grease becomes liquid, with 12 parts of anhydrous lanolin, and fill up with water to which 15% of spirit of wine has been added, to 300 parts. Admixture, such as cinchona extract, Peru balsam, quinine, tincture of cantharides, bay oil, ammonium carbonate, menthol, etc., may be made. The result is a yellowish-white, milky liquid, with a creamlike fat layer floating on the top, which is finely distributed by agitating.

9.—**Paste.**—a.—White Castile soap, 4 oz.; curd soap, powder, 2 oz.; potassium carbonate, 1 oz.; honey, 1 oz. Perfume to suit. Make a homogeneous paste by heating with a sufficient quantity of water.

b.—White Castile soap, in shavings, 2 oz.; ammonia water, 2 fl.oz.; bay rum, or cologne water, 1 fl.oz.; glycerine, 1 fl.oz.; water, 12 fl.oz. Dissolve the soap in the water, by means of heat; when nearly cold, stir in the other ingredients.

10.—**Powder.**—a.—(See preparation et perfume.)—For cleaning the hair. Powder very finely and carefully the bran of wheat, perfectly and absolutely dry, and to every pound add 2 oz. of powdered orris, and pass through a sieve.

b.—**Hair Wash Powder.**—Powdered borax, 1 lb.; camphor, 1 dr.; oil of bergamot, 20 minims. Mix.

c.—**Poudre Blonde** (for the hair).—Add yellow ochre to the best pearl starch, finely powdered, until the desired shade is obtained.

d.—Starch, finely powdered, 1½ lb.; orris root, ½ oz.; oil of rhodium, 5 drops.

e.—**Plain or Unscented Hair Powder.**—Pure wheat starch.

f.—Starch reduced to very fine powder, and then scented according to the fancy; it is lastly passed through a gauze sieve. In its simple form, without any addition,

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it constitutes plain hair powder. In other cases, it is distinguished by the name of the substance added to perfume it. Thus we have rose hair powder, violet hair powder, etc. Potato farina, well triturated, is now commonly used for hair powder.

g.—**Poudre de Gomme** (for false toupets).—Powder equal parts of gum arabic and tragacanth, and add ¼ of powder of orris, or white perfumed powder, with 1-3 of pulverized sugar candy. When used, this composition is to be made into a pasty consistency with a sufficient quantity of water.

h.—Powdered borax, 24 oz.; camphor, 3 oz.; potassium carbonate, in powder, 6 oz.; oil of eucalyptus, 4½ fl.dr.; oil of rosemary, 4½ fl.dr. Mix.

i.—Borax, 6 oz.; camphor, 60 gr.; oil of rosemary, 45 minims. Mix.

j.—Salts of tartar, 1 oz.; powdered borax, 1 oz.; powdered Castile soap, ½ oz.; oil of rose geranium, 20 drops. Mix, and put up above amount in a wide-mouthed bottle. Dissolve contents of bottle in 1½ pt. of soft water, and use as a shampoo.

k.—Powdered borax, 1 oz.; soda carbonate, dry, 1 oz.; powdered camphor, 20 gr.; oil of rosemary, 10 drops. Mix. This is for 1 qt. of water.

l.—Powdered borax, 3 oz.; potassium carbonate, 3 oz.; quillaja powder, 2 oz.; perfume, q. s. Mix. This is for 1 qt. of water.

11.—**Sea Foam.**—Sea foam and shampoo are both preparations to be applied to the head to remove dirt, dandruff, etc., from the scalp and hair. Barbers make the following distinction: "Dry shampoo" and "wet shampoo." If the first is desired, they employ "sea foam," which is a water-clear liquid preparation, containing a volatile alkali, glycerine, spirit and water, applied to the scalp and hair in just sufficient quantity to moisten the same, and by vigorous rubbing produces but a slight foam, which is removed by rubbing with a wet towel. When the second is asked for, a preparation is employed that contains soap, salts of tartar, borax and water—alcohol and glycerine being excluded, as the object is to produce a thick and firm lather, which is removed by means of a large quantity of water.

a.—Ammonia water, 1 fl.oz.; glycerine, 1 fl.oz.; alcohol, 6 fl.oz.; water, 8 fl.oz. Mix, and perfume if desired.

b.—For Barbers.—Dissolve in 8 oz. of alcohol 2 oz. of castor oil and 1 oz. of ammonia. Add this mixture to 1 qt. of water.



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c.—Without Ammonia, for Barber's Use.—To get a profuse lather in using a shampoo, soap should be present in the liquid or powder, or preferably soap bark. Grease will not be as readily removed as by alkali alone. Potassium carbonate, 4 dr.; white soap, 2 oz.; tincture of quillaja, 2 oz.; oil of lavender, 20 minims; alcohol, 8 oz.; water, 8 oz.

d.—Tropical Sea Foam.—Bay rum, 3 oz.; ammonia water, 3 oz.; water, 10 oz. Mix.

e.—Quillaja Sea Foam.—Fluid extract of quillaja, 4 oz.; glycerine, 2 oz.; cologne or bay rum, 4 oz.; alcohol, 8 oz.; rose water, 12 oz. Mix them. This does away with the odor of ammonia, which is disagreeable to many. Another very good one is:

f.—Dry Shampoo Sea Foam.—Powdered white soap (ivory, Castile or coconut-oil soap),  $\frac{1}{2}$  oz.; salts of tartar,  $\frac{1}{2}$  oz.; water, 8 oz.; tincture of soap bark, 1 oz.; bay rum, 8 oz.; distilled extract of witch hazel, 2 oz.; alcohol, 4 oz. Mix, dissolve, and filter if necessary. Apply to the hair, and rub dry with a towel.

g.—Borax, 2 parts; ammonium carbonate, 1 part; glycerine, 4 parts; Jamaica rum, 192 parts; bay rum, 64 parts; water, 64 parts. Dissolve the borax and ammonium carbonate in the water, and add the remaining ingredients in the order named.

h.—Ammonium carbonate, 6 parts; potassium carbonate, 32 parts; borax, 32 parts; soap spirit, 32 parts; bay rum, 128 parts; water, rain or distilled, q. s. to make 1,268 parts. Dissolve the salts in a portion of the water, add the soap spirit and bay rum, and finally the rest of the water.

12.—Rosemary Hair Wash.—Powdered borax, 30 gr.; tincture of cantharides, 1 dr.; spirit of rosemary, 4 dr.; camphor water, 5 oz.; rose water,  $2\frac{1}{2}$  oz. Dissolve the borax in the water, and add the other ingredients.

13.—Tar Shampoos.—a.—Tar, 1 dr.; linseed oil, 10 dr.; potassium hydroxide,  $2\frac{1}{2}$  dr.; alcohol, 75 minims; oil of rosemary,  $\frac{1}{2}$  dr.; water, q. s. Mix the tar with the linseed oil, and heat on a water bath to 140° F. Dissolve the potassium hydroxide in the alcohol and  $1\frac{1}{2}$  oz. of water; add the solution to the heated oil, with constant stirring. Continue the heat until saponification is complete, and make up to 4 oz. with water. Stir gently until cool, and add the oil of rosemary.

b.—Coconut oil, 5 dr.; tar, 45 gr.; potash lye, 40° B., 6 dr. Melt together

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the oil and tar, and saponify at a gentle heat, with the potash lye.

14.—Without Ammonia.—The following yields a preparation that gives a good lather and that is cheap: Castile soap, white, 2 oz.; potassium carbonate, 2 dr.; borax, 2 dr.; alcohol, 2 oz.; essential oil, sufficient to perfume; water, soft, sufficient to make 32 oz. Dissolve the soap, in the form of thin shavings, in  $1\frac{1}{2}$  pt. of water, by the aid of heat; then add the potassium carbonate and borax, both in powder, and dissolve. Dissolve the perfumed oil in the alcohol, and add to the other liquid. Finally, add enough soft water to make 32 oz.

Tonica.—1.—Ammonium carbonate, 30 gr.; distilled water, 10 dr.; tincture of cantharides,  $2\frac{1}{2}$  dr.; eau de cologne, 10 dr.; rum,  $7\frac{1}{2}$  oz.; oil of lavender, 2 drops. Dissolve the carbonate of ammonia in the water, mix the other ingredients together, and add.

2.—Balsam.—a.—Alcohol, 9 oz.; spirit of soap,  $3\frac{1}{2}$  oz.; tincture of cinchona, 2 oz.; tincture of cantharides, 1 dr.; balsam of Peru, 5 dr.; oil of bergamot, 2 dr.; oil of orange, 2 dr.; oil of rose geranium, 1 dr.

b.—Castor oil, 10 dr.; balsam of Peru, 3 dr.; Jamaica rum,  $12\frac{1}{2}$  oz.; distilled water, 6 oz.; tincture of cinchona,  $1\frac{1}{2}$  oz.; cologne water,  $1\frac{1}{2}$  oz.

3.—Cinchona Capillary.—Alcohol, 90%, 18 pt. 12 oz.; glycerine, 1 pt.; tincture of cinchona, 1 pt.; eau de cologne,  $2\frac{1}{2}$  pt.; extract of reseda, 7 oz.; extract of heliotrope, 7 oz.; orange-flower water, 1 pt. 9 oz.; tincture of gambir,  $4\frac{1}{2}$  oz. Mix.

4.—French Hair Tonic (Esprit de Cheveux).—Oleo-balsamic mixture, 4 fl.oz.; glycerine, 5 fl.oz.; rose water, 20 fl.oz.; tincture of cantharides,  $\frac{1}{2}$  fl.oz.; ammonium carbonate, 1 oz. Mix, shake thoroughly, let the mixture stand for 1 hour, and filter.

5.—Quinine Hair Wash.—a.—Sulphate of quinine, 8 gr.; eau de cologne, 2 oz.; bay rum, 2 oz.; glycerine, 2 dr.; rose water,  $3\frac{1}{2}$  oz.; alcohol, 4 dr. Dissolve the quinine in the eau de cologne, alcohol and bay rum, and add the glycerine and rose water gradually.

b.—Quinine sulphate, 1 part; tincture of cantharides, 10 parts; glycerine, 75 parts; alcohol, 500 parts; tincture of rhatany, 20 parts; spirit of lavender, 50 parts.

c.—Quinine sulphate, 20 gr.; bay rum, 4 fl. dr.; glycerine, 4 fl. dr.; tincture of cantharides, 2 fl. dr.; tincture of capsicum, 2 fl. dr.; water, enough to make 16 fl. oz. Mix, and dissolve.

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### (Lip Salves)

d.—Quinine sulphate, 20 gr.; glycerine, 1 fl.oz.; cologne water, 2 fl.oz.; bay rum, 2 fl.oz.; rose water, 11 fl.oz. Rub the quinine with the glycerine, and add the other ingredients in the order named. The addition of fluid extract of Jaborandi is recommended to stimulate the growth.

e.—Quinine sulphate, 30 gr.; acetic acid, 2 fl.dr.; resorcin, 120 gr.; water, 4 fl.oz.; oil of eucalyptus, 2 fl.dr.; tincture of cantharides, 3 fl.dr.; alcohol, 12 fl.oz. Mix all, dissolve by agitation, and filter.

f.—Quinine sulphate, 20 gr.; tincture of cantharides, 2 fl.dr.; fluid extract of Jaborandi, 2 fl.dr.; alcohol, 2 fl.oz.; glycerine, 2 fl.oz.; bay rum, 6 fl.oz.; rose water, enough to make 16 fl.oz. The quinine should be dissolved in the alcoholic liquids by warming slightly, then the other ingredients added, and the whole filtered.

g.—Tincture of cinchona, 500 parts; spirits of wine, 2,500 parts; eau de cologne, 250 parts; Jamaica rum, 100 parts; pure alcohol, 150 parts; spirits of soap, 100 parts; quillaja bark, 20 parts; balsam of Peru, 10 parts; oil of bergamot, 10 parts; oil of geranium, 3 parts; oil of neroli, 5 parts; tincture of rantharides, 25 parts; castor oil, 15 parts; anchusa, 10 parts; turmeric, 1 part. The whole should be digested for 6 days and then filtered.

### Hair Brush Powder.

Dried sodium carbonate, 12 oz.; powdered Castile soap, 4 oz.; oil of lavender, 10 minims; oil of verbena, 2 minims.

### Lip Salve.

1.—Spermaceti, 40 parts; lard, perfectly pure and fresh, 80 parts; white wax, 20 parts; oil of sweet almonds, 5 to 10 parts. According to the season of the year, are melted together, the mixture colored with a sufficient quantity of alkanet, by digesting the root with the melted mass, and the latter then suitably perfumed, for instance, with oil of bergamot, 2 parts; oil of orange, 3 parts. The mass is then poured out into molds. It is customary to pour it into tin tubes, from which it is removed when cold, and then covered with tinfoil.

2.—Spermaceti, 1 oz.; yellow wax,  $\frac{1}{4}$  oz.; oil of almonds, 2 oz.; oil of rose, 12 drops. Melt with gentle heat, add alkanet root, q. s. to color, then strain; and lastly, add the oil of rose.

3.—Paraffine, 49 grams; vaselline, 49 grams; oil of lemon, oil of violet, of each 0.75 gram; carmine, q. s.

4.—Glycerine cream, 4 oz.; boracic acid,

### (Listerine)

$\frac{1}{2}$  oz.; carmine, 4 gr. Mix thoroughly, and dispense in screw-top porcelain jars or in specially made metal boxes.

5.—Coral Lip Salves.—White wax, 70 grams; vaseline, 100 grams; alkannin, 0.25 gram; essential oil of lemon, 1 gram; essential oil of bergamot, 1 gram; essential oil of roses, 0.5 gram.

6.—Olive oil, benzoated, 500 grams; white wax, 300 grams; cetacci, 30 grams; alkannin, 1 gram; essential oil of jasmine, 5 grams; essential oil of roses, 3 drops.

7.—Camphor Cerate.—Olive oil,  $\frac{1}{4}$  lb.; pure white wax,  $\frac{1}{4}$  lb.; spermaceti, 2 oz.; camphor,  $\frac{1}{2}$  oz. Mix, as directed under camphor balls. Used as an application to chaps, chilblains, abrasions, excoriations, etc.; also as lip salve in cold weather, as a hair cosmetic, and as a mild, stimulating and anodyne friction.

8.—Lip Salve in Sticks.—Precipitated chalk, 1 oz.; carmine, 10 gr.; ammonia water, enough; spermaceti, 1 oz.; white wax,  $\frac{1}{4}$  oz.; expressed almond oil, 4 oz.; perfume, enough. Dissolve the carmine in a sufficient quantity of ammonia water, and triturate with the chalk. Melt the waxes with the oil, and when ready to set, stir in the tinted chalk and the perfume; stir well, and pour into suitable molds or containers.

### Listerine.

The following formulas give preparations said to resemble Listerine; the true formula is kept secret by the manufacturer.

1.—Boric acid, 128 gr.; thymol, 16 gr.; menthol, 16 gr.; oil of eucalyptus, 4 drops; oil of wintergreen, 4 drops; oil of horsemint, 4 drops; water, 12 oz.; alcohol, 4 oz.; caramel, 1 or 2 drops. Dissolve the boric acid in the water and the other ingredients in the alcohol, and mix the solutions. Let stand for a day or two, with frequent shaking, and filter. As an improvement on this formula, it has been suggested that only half the quantity of the menthol and oil of horsemint be used; in the proportions prescribed they dominate the solution so far as odor and taste are concerned.

2.—Acid benzoic, 2 dr.; borax, 2 dr.; boric acid, 4 dr.; thymol,  $\frac{3}{4}$  dr.; eucalyptol, 10 drops; oil of wintergreen, 10 drops; oil of peppermint, 6 drops; oil of thyme, 2 drops; rectified spirits, 5 $\frac{3}{4}$  oz.; water, enough to make 31 fl.oz. This still lacks baptisia. It is claimed by the makers that this is one of the ingredients used.

3.—Oil of eucalyptus, 10 gr.; oil of wintergreen, 10 gr.; menthol, 10 gr.; thymol, 10 gr.; boric acid,  $\frac{1}{2}$  oz.; alcohol,

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### (Manicure Preparations)

4½ fl.oz.; water, sufficient to make 16 fl.oz.

4.—Benzole acid, 64 gr.; boracic acid, 128 gr.; thymol, 30 gr.; menthol, 30 gr.; borax, 64 gr.; oil of eucalyptus, 4 drops; oil of wintergreen, 4 drops; oil of horse-mint, 5 drops; alcohol, 4 oz. Water, enough to make 1 pt.

#### Manicure Preparations.

1.—*Cleaning Liquid for the Nails.*—Tartaric acid, 1 dr.; tincture of myrrh, 1 dr.; cologne water, 2 dr.; water, 3 oz. Dissolve the acid in the water; mix the tincture of myrrh and cologne, and add to the acid solution. Dip the nails in this solution, wipe, and polish with chamois skin.

2.—*Coloring for Finger Tips.*—Alkanet root, ½ oz.; alcohol, 12 oz.; rose water, 4 oz. Macerate for a week, add 10 drops of otto of rose, shake, and filter.

3.—*Enamels.*—a.—From a not very thorough examination of one of the "enamels" on the market, we conclude that it can be practically duplicated by this formula: Tin oxide, 1 dr.; white wax, 2 dr.; paraffine, 6 dr.; oil-soluble aniline dye, enough to color.

b.—Japan wax, 1,000 parts; petrolatum, 6,200 parts; spermaceti, 200 parts; alkannin, 25 parts; turpentine, 150 parts; acetic acid, 30 parts. The fatty substances are melted together, the alkannin dissolved in the hot liquid, and the acetic acid, mixed with any suitable perfume, finally added.

4.—*Polishing and Bleaching.*—a.—A solution of oxalic or tartaric acid may be used as a "bleach." Tartaric acid, 30 gr.; rose water, 1 oz.

b.—White Castile soap, 1 part; hot water, 16 parts; 10% zinc chloride solution, q. s. Dissolve the soap in the water, and to the solution add the zinc chloride solution until no further precipitation occurs. Let stand overnight, pour off the supernatant fluid, wash the precipitate well with water, and dry at the ordinary temperature. Carmine may be added if desired.

c.—Tin oxide, 30 grams; carmine, 0.9 gram; rose oil, 6 drops; neroli oil, 5 drops.

d.—Cinnabar, 3.75 grams; infusorial earth, 30 grams.

e.—Fine putty powder, 4 dr.; carmine, 2 gr.; oil of rose, 1 drop.

f.—Tin peroxide, 6 oz.; tragacanth, 6 gr.; glycerine, 4 drops; rose water, sufficient.

g.—Fine tin oxide, 8 oz.; carmine, 35

### (Manicure Preparations)

gr.; oil of bergamot, 20 gr.; oil of lavender, 20 gr.

After the use of any one of the above polishes the following mixture is to be applied, either by friction with a soft leather or as an enamel with a camel's-hair pencil: Paraffine wax, 1 dr.; chloroform, 2 dr.; rose oil, 3 drops.

h.—*Non-abrassive Nail Polishes.*—(1) White wax, 1 oz.; cotton-seed oil, 2 oz.; carmine, 5 gr.; oil of rose, 5 drops. Melt the wax, add the oil, triturate the carmine to fine powder, mix intimately with the melted fats, and then incorporate the oil of rose.

(2) Eosin, 10 gr.; white wax, ½ dr.; spermaceti, ½ dr.; soft paraffine, 1 oz.; alcohol, enough. Dissolve the eosin in as little alcohol as will suffice; melt the other ingredients together; add the solution, and stir until cool.

(3) White wax, 1 dr.; spermaceti, 1 dr.; soft paraffine, 2 oz. Melt together, and stir until cold.

i.—Rotten stone, 1 oz.; magnesium carbonate, heavy, 4 oz.; phosphate of lime or precipitated silica, 1 lb.

j.—Rouge, ½ oz.; magnesium carbonate, heavy, 8 oz.; precipitated chalk, 1 lb. Triturate the rouge with 2 oz. of the chalk for 5 minutes, and gradually add the rest of the powders. Sift 3 times.

k.—Magnesium carbonate, 2 oz.; powdered rouge, 2 oz.; white bole, 10 oz.; lead carbonate, 12½ oz.; prepared chalk, 25 oz. Mix thoroughly. This powder may be used with a little water, or made into a paste with oleic acid and used as a polishing "pomade."

l.—*Polish, in Cake Form.*—A "nail-polishing stick" is made as follows, although the preparation may be worked up in "cake" form if desired: Putty powder, 8 oz.; carmine, 20 gr.; perfume, sufficient; mucilage of tragacanth, sufficient. The powders and perfume are well mixed, then massed with the mucilage, and piped on a pill machine.

m.—Precipitated silica, 1 oz.; prepared chalk, ½ oz.; stannic oxide, ½ oz.; otto of rose, 1 drop. Tint with a solution of carmine.

n.—Precipitated silica, 1 oz.; tin oleate, ½ oz.; essence of eau de cologne, 2 drops. Tint as in the preceding.

o.—*Polishing the Nails.*—If the nails are stained, apply a little lemon juice. A little pumice stone, in a very fine powder, or a little putty powder, may be used to polish the nails. This is frequently colored with a decoction of cochineal. Apply with a piece of chamois skin.

## Toilet Preparations

### (Mouth Washes)

5.—*Preparations for the Nails*.—The best substance that can be found for keeping the finger nails in a healthy condition, says an authority, is citric acid. It is best applied in the form of solution, of which the following is an example: Orange-flower water, 1,200 parts; glycerine, 125 parts; citric acid, 85 parts. Frequent washing with this solution is apt to harden the nails and cause them to crack. It is, therefore, advisable to employ in conjunction with it a paste of the following composition: Almond meal, 10 parts; powdered orris root, 10 parts; honey, about 3 parts; rose water, about 4 parts. The quantity of honey and of rose water to be employed depends upon the consistency it is desired to give the paste.

6.—*White Spots on Nails*.—These are caused by opacity of the cells, due to injury. Do not apply any chemicals, but rub the nail with pumice-stone powder, moistened. As the nail grows the spots will disappear.

### Menthol Preparations.

1.—*Menthol Ice*.—Spermaceti, 10 parts; paraffine oil, 10 parts; menthol, 10 parts. Melt the first two and add the third ingredient. This is to be rubbed on the nose for catarrh.

2.—*Smelling Salt*.—Menthol, 10 parts; alcohol, 78 parts; water of ammonia, 12 parts. Dissolve the menthol in the spirit, and add the water of ammonia.

3.—*Toothache Drops*.—Menthol, 8 drops; chloroform, 8 parts; alcohol, 84 parts.

4.—*Vinegar*.—Menthol, 3 parts; vinegar, 97 parts. To be used with water, as a gargle.

### Mouth Washes.

1.—*Alkaline Mouth Wash*.—Sodium borobenzonate (N. F.), 12 gr.; resorcinol, 80 gr.; glycerine, 4 dr.; alcohol, 2 oz.; oil of peppermint, 4 minims; oil of cinnamon, 8 minims; eucalyptol, 8 minims; purified talc, enough; distilled water, enough to make 1 pt. Use 1 part to 3 or 4 parts of water.

2.—*Antiseptic Mouth Wash*.—a.—Thymol, 4 gr.; benzoic acid, 14 gr.; tincture of eucalyptus, 225 gr.; essence of peppermint, 9 gr.; chloroform, 15 gr.; alcohol, 3 gr. Mix. Twenty drops of this solution in a glass of water may be used at a time.

b.—Salol, 40 parts; boric acid, 5 parts; oil of eucalyptus, 3 parts; tincture of benzoin, 40 parts; oil of peppermint, 40 parts; oil of star anise, 8 parts; oil of

### (Mouth Washes)

clove, 3 parts; oil of cinnamon, 1 part; spirit of wine, rectified, 2,000 parts; distilled water, 500 parts. Mix. All of these are to be used in the same manner, a few drops to half a tumblerful of water.

3.—*Cachous, or Mouth Pastils*.—Large-ly used by smokers and persons with impure breaths. The gilding or silvering is effected in the way usually adopted for pills, viz.: A leaf or two of gold or silver is placed in a gallipot; on this an appropriate number of pills or pastils, and then another leaf of the metal. The mouth of the gallipot is next covered with a piece of smooth writing paper, and on this the palm of the hand is placed, when a sudden and rapid circular motion is given to the whole for a second or two. Another method is to shake them, in a similar manner, with a little gold dust or silver dust. When pills are gilded or silvered immediately after being prepared, they are usually sufficiently moist or sticky to cause the leaf or dust to adhere; but should they be otherwise, they should be previously placed in damp air for a few minutes, or rubbed between the fingers or the palms of the hands, very slightly moistened with thin mucilage, so as to render them somewhat sticky, but not wet. Mouth pastils are preferably not coated until they are dry and hard, and hence generally require one or other of these modes of treatment. The products of the following formulæ are among those most highly esteemed:

a.—Take of soft extract of licorice, 3 oz.; catechu, in fine powder, 1 oz.; white sugar, 1 oz.; gum tragacanth,  $\frac{1}{2}$  oz.; oil of cloves, 1 fl.dr.; oil of cassia,  $\frac{1}{2}$  fl.dr.; oil of nutmeg, essence of ambergris (royale), of each 12 drops. Mix as before explained; beat the mixture to a firm, uniform mass with eau de rose, or eau de fleurs d'oranges, q. s., and form it into 1-gr. or 2-gr. pills. Lastly, when dry, silver them. The stock of them should be kept in bottles or tin canisters, and only a sufficient number of boxes for present sale filled at once.

b.—M. Chevallier.—Take of fresh roasted coffee, in fine powder,  $1\frac{1}{2}$  oz.; chocolate, in fine powder,  $1\frac{1}{2}$  oz.; white sugar, in fine powder,  $1\frac{1}{2}$  oz.; vanillin, in fine powder, 1 oz.; charcoal (recent), in fine powder, 1 oz.; mucilage of tragacanth, to mix, q. s. The preceding, sucked *ad libitum*, are used to sweeten and perfume the breath; the last also acts by chemically deodorizing it. They are great favorites in the fashionable world among smokers.

c.—Take of chloride of lime, good dry,

## Toilet Preparations—Perfumes

### (Perfumery and Toilet Waters)

1 dr.; white sugar, powdered, 3 oz.; gum tragacanth, powdered, 1 oz. Mix; add of oil of cloves or peppermint,  $\frac{1}{2}$  fl. dr.; mix thoroughly, and beat up the mass with rose water. This acts chemically as a disinfectant, deodorizer and bleacher, but should be only occasionally and sparingly used, as the chloride in them attacks the enamel of the teeth. One at a time is sufficient. The saliva should not be swallowed, and the mouth should be rinsed with water soon afterward.

d.—Extract of licorice, 1 oz.; oil of cloves,  $\frac{1}{2}$  dr.; oil of cinnamon, 5 drops; moisten 1-gr. pills with this solution, and silver.

e.—Ground coffee,  $\frac{3}{4}$  oz.; finely powdered charcoal,  $\frac{1}{2}$  oz.; sugar,  $\frac{1}{2}$  oz.; vanilla,  $\frac{1}{2}$  oz.; mucilage, q. s. Make into lozenges.

4.—*Eucalyptus Mouth Wash*.—Thymol, 0.25 gram; tincture of eucalyptus, 15 grams; absolute alcohol, 100 grams; oil of peppermint, 1 gram.

5.—*Peroxide Mouth Wash*.—Thymol, 0.5 gram; menthol, 0.5 gram; alcohol, 50 grams; tincture of krameria, 30 grams; hydrogen peroxide (12%), 120 grams. A few drops to be used with a tumblerful of water.

6.—*Salol Astringent*.—Salol, 30 gr.; tannin, 30 gr.; saccharine, 4 gr.; safranine hydrochloride,  $\frac{1}{2}$  gr.; spirit of lavender, 225 minims; spirit of melissa, 225 minims; spirit of peppermint, 12 drops; cologne water, 23 $\frac{1}{2}$  oz.

7.—*Tablets*.—For 100 tablets: Heliotropine, 1 cgm.; saccharine, 1 cgm.; salicylic acid, 10 cgm.; menthol, 1 gram; milk sugar, 5 grams; spirit of rose, q. s. May be colored red with eosin, green with chlorophyll, or blue with indigo carmine.

8.—*Thymobenzoinform*.—Thymol, 4 gr.; benzoic acid, 14 gr.; tincture of eucalyptus, 225 minims; oil of peppermint, 9 minims; chloroform, 15 minims; alcohol, 3 oz. Twenty drops in a glass of water, as a mouth wash.

9.—*Thymol Mouth Wash*.—Thymol, 15 parts; oil of peppermint, 25 parts; tincture of myrrh, 30 parts; oil of eucalyptus, 6 parts; rectified spirit of wine, 2,000 parts; distilled water, 400 parts. Mix.

10.—*Witch Hazel*.—Hamamelis water, 18 oz.; tincture of myrrh, 9 oz.; honey of roses, 4 oz.; tannic acid,  $\frac{1}{2}$  oz.; sodium salicylate,  $\frac{1}{2}$  oz.

### PERFUMERY AND TOILET WATERS

#### Perfumes.

The perfumes for the toilet are either simple or compound; the former are called

### (Perfumery and Toilet Waters)

extracts or essences, and the latter bouquets. Unfortunately, the language of the perfumer is French, and this has led to many mistakes in classification, and the terms, *extraits*, *essence*, *caux* and *parfumes* are very loosely applied. Some works call essential oils *otios* or *essences*, and the confusion is so great that the different terms will be properly defined; but in the receipts no attempt has been made to separate them into classes, and they are arranged alphabetically according to the flowers or name. By far the larger number of the materials used by the perfumer come from the vegetable kingdom, but there are some exceptions, as ambergris, musk and civet. The number of flowers used by the perfumer is very limited, but, by a judicious combination, or rather blending, almost any odor may be obtained. The odors of plants reside in different parts of them, sometimes in the roots, as in the iris and vitivert; the stem or wood, in cedar and santal; the leaves, in mint, patchouly and thyme; the flower, in the roses and violets; the seeds, in the Tonquin bean and caraway; the bark, in cinnamon, etc. Some plants yield more than one odor, which are quite distinct and characteristic. The orange tree, for instance, gives three; from the leaves, one called *petit grain*; from the flowers we procure *neroli*, and from the rind of the fruit, essential oil of orange, named *Portugal*. On this account, perhaps, this tree is the most valuable of all to the operative perfumer. The fragrance or odor of plants is owing, in nearly all cases, to a perfectly volatile oil, either contained in small vessels, or sacs, within them, or generated from time to time during their life, as when in blossom. Some few exude, by incision, odoriferous gums, as benzoin, oilbanum, myrrh, etc.; others give, by the same act, what are called balsams, which appear to be mixtures of an odoriferous oil and an odoriferous gum. Some of these balsams are procured in the country to which the plant is indigenous, by boiling it in water for a time, straining, and then boiling again, or evaporating it down till it assumes the consistency of treacle. In this latter way is balsam of Peru procured from the *Myrocydon peruvianum*, and the balsam of Tolu from the *Myrocydon toluiferum*. Though these odors are agreeable, they are not much applied in perfumery for handkerchief use, but by some they are mixed with soap, and in England they are valued more for their medicinal properties than for their fragrance. The odors of flowers are more

## Toilet Preparations—Perfumes

### (Ottos)

generally secreted during the sunshine, or at least in the daytime, but there are some which yield no odor in the day but are very fragrant in the evening, such as the *Cestrum nocturnum*, the *Lychnis vespertina*, some of the *Catasetum*, and the *Cymbidium*.

*Ottos from Plants*.—Quantities of ottos, otherwise essential oils, yielded by various plants:

	lb.	Otto, oz.
Orange peel.....	10	yield about 1
Dry marjoram herb..	20	" 3
Fresh marjoram herb	100	" 3
Fresh peppermint....	100	" 3 to 4
Dry peppermint.....	25	" 3 to 4
Dry origanum.....	25	" 2 to 3
Dry thyme.....	20	" 1 to 1½
Dry calamus.....	25	" 3 to 4
Anise seed.....	25	" 9 to 12
Caraway.....	25	" 16
Cloves.....	1	" 2½
Cinnamon.....	25	" 3
Cassia.....	25	" 3
Cedar wood.....	28	" 4
Mace.....	2	" 3
Nutmegs.....	2	" 3 to 4
Fresh balm herb....	60	" 1 to 1½
Cake of bitter almond	14	" 1
Sweet flag root.....	112	" 16
Geranium leaves.....	112	" 2
Lavender flowers....	112	" 30 to 32
Myrtle leaves.....	112	" 5
Patchouly herb.....	112	" 28
Provence rose blossom	112	" 1½ to 2
Rhodium wood.....	112	" 3 to 4
Santal wood.....	112	" 30
Vitiver or kuskus root	112	" 15
Violets.....	112	" ½ dr

### Boiling and Congealing Temperatures of Various Ottos, etc.—

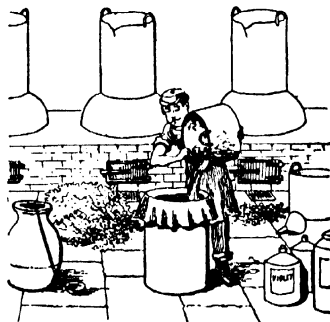
	Deg. Fah.
Almond oil will not boil.....	660
Otto of patchouly boils.....	515
" vitiver boils.....	548
" santal wood boils.....	550
" cedar wood boils.....	507
" English lavender boils....	475
" lemon grass boils.....	440
" rose (pure Turkish) boils..	432
" geranium (Spanish) boils..	430
" geranium (Indian) boils..	420
" gaultheria boils.....	400
" almonds boils.....	356
" bergamot (pure) boils....	370
" caraway boils.....	348
" lemon peel boils.....	345
" orange peel boils.....	345
" French lavender (spike)..	180
" white wax melts.....	150

### (Preparation of Perfumes)

	Deg. Fah.
Otto of camphor sublimes.....	145
" spermaceti melts.....	112
" paraffine A.....	102
" paraffine B.....	90
" otto rose (Italian) congeals	82
" otto rose (Turkish) congeals	58
" geranium, neroli, cloves, deposit crystals.....	2
" santal, cedar, lemon grass, congeal to a jelly.....	— 5
" bergamot congeals.....	—12
" cinnamon still fluid.....	—13

Perfumes are extracted from plants as follows: From the flowers by enfleurage, absorption or maceration; from the roots by trituration; and by distillation from the seeds. The processes are divided into four distinct operations, viz.: 1, expression; 2, distillation; 3, maceration; 4, absorption.

*Processes*.—1.—Expression is only adopted where the plant is very prolific in its volatile or essential oil; i.e., its odor, such, for instance, as is found in the pellicle or outer peel of the orange, lemon and citron, and a few others. In these cases the parts of the plant containing the odoriferous principle are put sometimes in a cloth bag and at others by themselves into a press, and by mere mechanical force it is squeezed out. The press is an iron vessel of immense strength, varying in size from 6 in. in diameter and 12 in. deep, and upward, to contain one hundredweight or more; it has a small aperture at the bottom to allow the expressed material to run for collection; in the interior is placed a perforated false bottom, and on this the



Macerating Over Water Baths

## Toilet Preparations—Perfumes

### (Preparation of Perfumes)

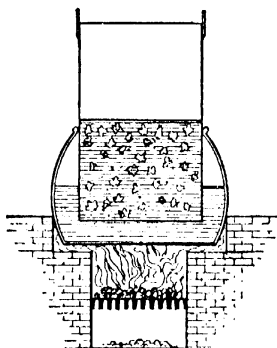
substance to be squeezed is placed, covered with an iron plate fitting the interior. This is connected with a powerful screw, which, being turned, forces the substance so closely together that the little vessels containing the essential oils are burst, and it thus escapes. The common tincture press is indeed a model of such an instrument. The oils which are thus collected are contaminated with watery extract, which exudes at the same time, and from which it has to be separated; this it does by itself to a certain extent, by standing in a quiet place, and it is then poured off and filtered when requisite.

2.—*Distillation.*—The plant, or part of it which contains the odoriferous principle, is placed in an iron, copper or glass pan, varying in size from that capable of holding from 1 to 20 gal., and covered with water; to the pan a dome-shaped lid is fitted, terminating with a pipe, which is twisted, corkscrew fashion, and fixed in a bucket, with the end peeping out like a tap in a barrel. The water in the still—for such is the name of the apparatus—is made to boil; and having no other exit, the steam must pass through the coiled pipe, which, being surrounded with cold water in the bucket, condenses the vapor before it can arrive at the tap. With the steam the volatile oil—i.e., perfume—rises, and is liquefied at the same time. The liquids which thus run over, on standing for a time, separate into two portions, and are finally divided with a funnel having a stopcock in the narrow part of it. By this process the majority of the volatile ottos are procured. In some few instances alcohol is placed upon the odorous materials in lieu of water, which, on being distilled, comes away with the perfuming substance dissolved in it. But this process is now nearly obsolete, as it is found more beneficial to draw the oil or essence, first with water, and afterward to dissolve it in the spirit. The low temperature at which spirits boil, compared with water, causes a great loss of otto, the heat not being sufficient to disengage it from the plant, especially where seeds, such as cloves or caraway, are employed.

3.—*Maceration.* This operation is conducted thus: For what is called a pomade, a certain quantity of purified beef or deer suet, mixed with purified lard, is put into a clean metal or porcelain pan; this being melted by steam heat or bath, the kind of flowers required for the odor wanted are carefully picked and put to the liquid fat, and allowed to re-

### (Preparation of Perfumes)

main from 12 to 48 hours; the fat has a particular affinity or attraction for the otto of flowers, and thus, as it were, draws it out of them, and becomes itself, by their aid, highly perfumed; the fat is strained from the spent flowers, and fresh



Section of a Perfume Macerator and Water Bath

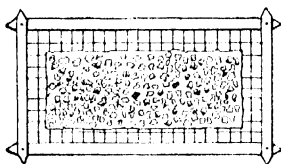
are added 10 or 15 times over, till the pomade is of the required strength; these various strengths of pomatums are noted by the French makers as Nos. 6, 12, 18 and 24, the higher numerals indicating the amount of fragrance in them. For perfumed oils, the same operation is followed; but, in lieu of suet, fine olive oil, and the same results are obtained. These oils are called *huile antique* of such and such a flower. The orange, rose and cassie compounds are principally prepared by this process. The violet and *rézède* pomades and oils are prepared first by the maceration process, and then finished by *enfleurage*. When neither of the three foregoing processes gives satisfactory results, the method of procedure adopted is by—

4.—*Absorption or Enfleurage.*—Of all the processes for procuring the perfumes of flowers, this is the most important to the perfumer, and is the least understood in England; as this operation yields not only the most exquisite essence indirectly, but also nearly all those fine pomades known here as “French pomatums,” much admired for their strength of fragrance, together with “French oils,” equally perfumed. The odors of some flowers are so delicate and volatile that the heat re-

## Toilet Preparations—Perfumes

### (Preparation of Perfumes)

quired in the previously named processes would greatly modify, if not entirely spoil them; this process is, therefore, conducted cold, thus: Square frames, called a *châssis*, about 3 in. deep, with a glass bottom, say 2 ft. wide and 3 ft. long, are procured; over the glass a layer of fat is spread, about  $\frac{1}{4}$  in. thick, with a kind of plaster knife or spatula; on this the flower buds are sprinkled, completely over it, and there left from 12 to 72 hours. For oils of the same plants, coarse cotton cloths are imbued with the finest olive oil, and laid upon a frame containing wire gauze in lieu of glass; on these the flowers are laid, and suffered to remain till fresh flowers are procured. This operation is repeated several times, after which the cloths are subject to a great pressure to remove the now perfumed oil. But for the pharmacist and the amateur, who desire to make only small quantities, the better, and, in fact, the only way, is to buy the essential oils and prepare the perfume with their aid, as this requires no large plant or expenditure of capital. Care should be used to get deodorized alcohol, and all materials should be purchased of large drug houses who make a specialty of the expensive essential oils. The prices which are given in some receipts are only approximate, and were taken with the original receipt.



Wire Frame for Enfleurage

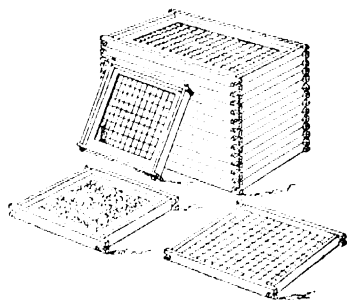
### Definitions of Terms.

**Rouquets.**—Perfumes where the odor of no one flower can be discovered as predominating over another.

**Esprits.**—The same *esprits* is commonly given by the perfumers to alcoholic solutions of the fragrant essential oils and other odorous and aromatic substances. As a rule, esprits are less highly charged with odorous principles, and have less alcoholic strength than essences and extracts, as well as having little color, if any; but the term is often very loosely and capriciously applied in the trade, just as its synonym or analogue, spirit, is in English.

### (Preparation of Perfumes)

**Essences.**—The term essence is commonly very loosely applied to preparations that differ greatly from each other, and which are presumed or pretended to contain the essential principles or qualities of anything disencumbered of grosser matter. Thus, the essential or volatile oils obtained from vegetable substances, by distillation, are frequently called essences, as well as a strong solution of them in rectified spirit, a system of nomenclature which continually leads to confusion and mistakes. In pharmacy, the concentrated infusions, decoctions, liquors, solutions and tinctures are also frequently called essences by those who vend them. In perfumery, a similar loose application of the term prevails; but it is more particularly appropriated to concentrated, or somewhat concentrated, alcoholic solutions of the essential oils and other fragrant substances, whether obtained by simple admixture, by distillation, or by digestion, as in making tinctures. Indeed, the fragrant essences of the perfumers differ from their *eaux*, *esprits*, tinctures and other forms of perfumed spirits, merely in their greater richness in the odorous principles that characterize them, and the greater strength of the spirit that holds these principles in solution.



Frames Ready for the Press

**Extrait, Extracts.**—In French perfumery, these are, appropriately, strong spirituous solutions, either simple or compound, of the essential oils and odorous principles of plants, and other substances obtained by infusion or digestion, as distinguished from those that are obtained by distillation and direct solution. Under the term, however, are often classed many perfumes prepared with rectified



## Toilet Preparations—Perfumes

### (Bay Rum)

spirit by the latter methods, and which are highly charged with the fragrant matter, or matters, which they represent. The preparation of most of the *extraits* is simple enough, the chief care necessary being that the spirit be absolutely scentless, and of sufficient strength, and that the oils and other materials be recent and perfectly pure. With some flowers of extremely delicate perfume, highly perfumed spirit of the finest quality cannot well be obtained either by infusion or distillation, or by simple solution of the respective essential oils; or, at least, they are not usually so prepared by the Continental perfumers, who are undoubtedly the best judges in such matters. For these, an entirely different and a rather tedious and indirect method is pursued. Pure rectified spirit is digested, for 3 or 4 days, on half its weight of the oils or pomades obtained by infusion or contact from the respective flowers. The operation is performed in a securely closed vessel or digester of porcelain or tinned copper, set in a water bath, frequent agitation being employed during the whole time. After the whole has become quite cold the vessel is opened, and the perfumed spirit carefully decanted into a second similar vessel or digester, containing a like quantity of oil to the first one. The whole process is then repeated a second time; and again a third time, with fresh oil or pomade. Finally, the cold spirit, after sufficient repose, is very carefully decanted through a glass or porcelain funnel, stopped with a small wad of cotton wool, into the receiver or store bottle.

### Alcohol.

One of the first requisites in the manufacture of good perfumes is pure alcohol, free from fusel oil or other foreign flavor. The purer grade of spirit is known in commerce as pure spirits, silent spirits, or deodorized alcohol, and may readily be distinguished from ordinary alcohol by the absence of that peculiar pungency of odor which is present to a greater or less extent in most commercial samples.

### Bay Rum.

1.—Alcohol, 8 fl.oz.; oil of bay, 40 drops; oil of mace, 1 gr.; oil of orange, 20 drops; Jamaica rum, 1 fl.oz.; water, enough to make 16 fl.oz. Digest 2 or 3 weeks, and filter through magnesia.

2.—Alcohol, 8 fl.oz.; oil of bay, 2 dr.; oil of cloves, 1 drop; mace, 20 gr.; water, warmed to 80° F., enough to make 12 fl.oz. Dissolve the oils in the alcohol; digest the mace in the solution for a few days; filter, and add the water. The

### (Bay Rum)

whole is allowed to stand, with occasional agitation, for several days, and filtered through magnesia.

3.—Jamaica rum, 36 fl.oz.; 95% alcohol, 36 fl.oz.; oil of bay,  $\frac{1}{2}$  fl.oz.; oil of pimento, 1 drop; acetic ether, 4 drops. Allow to stand at least 3 weeks before using.

4.—Oil of bay, 33 c.c.; oil of orange, 2.5 c.c.; oil of pimento, 2 c.c.; alcohol, 2,000 c.c. After dissolving the oils in the alcohol, mixed in a suitable bottle, the mixture is allowed to stand for 24 hours, occasionally shaking. Then add water, 1,500 c.c.; calcined magnesia, 25 grams. Shake occasionally, and allow to stand for another 24 hours. Filter. A perfectly clear and sparkling product is much more readily obtained than with the U. S. P. process.

5.—Oil of myrcia acris, 33; sweet orange oil, 2.5; pimento oil, 2; 96% alcohol, 2,000. Mix, and allow to stand for 24 hours, with frequent shaking. Then add water, 1,500, and magnesia, 25. Shake together at intervals, for 12 hours, and filter.

6.—Bay rum, or, more properly, bay spirit, may be made from the oil, with weak alcohol, as here directed: Oil of bay leaves, 3 dr.; oil of orange peel,  $\frac{1}{2}$  dr.; tincture of orange peel, 2 oz.; magnesium carbonate,  $\frac{1}{2}$  oz.; alcohol, 4 pt.; water, 4 pt. Triturate the oils with the magnesium carbonate, gradually adding the other ingredients, previously mixed, and filter. The tincture of orange peel is used chiefly as a coloring for the mixture. Oil of bay leaves, as found in the market, varies in quality. The most costly will presumably be found the best, and its use will not make the product expensive. It can be made from the best oil and deodorized alcohol, and still be sold at a moderate price with a good profit. Especial care should be taken to use only perfectly fresh oil of orange peel. As is well known, this oil deteriorates rapidly on exposure to the air, acquiring an odor similar to that of turpentine. The oil should be kept in bottles of such size that when opened the contents can be all used in a short time.

7. *For Barbers' Use.*—a.—Oil of bay,  $1\frac{1}{2}$  fl.dr.; oil of pimento,  $\frac{3}{4}$  fl.dr.; acetic ether,  $1\frac{1}{2}$  fl.dr.; alcohol, 2 pt.; water, 2 pt. Mix the oils and acetic ether with the alcohol, add the water, and filter.

b.—Oil of bay, 2 fl.dr.; Jamaica rum, 4 fl.oz.; alcohol,  $1\frac{1}{2}$  pt.; water,  $2\frac{1}{4}$  pt. This preparation may be made clear and bright by filtering through magnesia and charcoal.

## Toilet Preparations—Perfumes

### (Colognes)

**Foaming Bay Rum.**—(1) Oil of pimento, 16 grams; oil of lemon, 1 gram; oil of mace, 1 gram; oil of cloves, 1 gram; oil of sweet orange, 1 gram; essence of rum, 75 grams; alcohol, 2,650 grams.  
(2) Ammonium carbonate, 1%, 90 grams; or 2%, 45 grams; distilled water, sufficient to make 4,500 grams. The ammonium carbonate is dissolved in the distilled water, without heating, and the solution added to mixture (1). The whole is allowed to stand 1 week, and finally filtered through asbestos.

### Colognes.

1.—Oil of bergamot, 1 gram; oil of lemon, 2.5 grams; oil of neroli, 1.5 grams; oil of rosemary, 1 gram; 96% alcohol, 300 grams; orange-flower water, 75 grams.

2.—Oil of bergamot, 8 grams; oil of lemon, 4 grams; oil of neroli, 1 gram; oil of origanum, 6 drops; oil of rosemary, 1 gram; 96% alcohol, 600 grams; orange-flower water, 50 grams.

Cologne water improves with age, acquiring, on keeping, a characteristically delicate odor. This is supposed to be the result of a special etherification of the alcohol with the oils, and resulting intermolecular changes. The manufacturers of cologne water accelerate this change either by exposing the water, in glass-stoppered bottles, to the action of the sun's rays, or by warming it gently in a water bath for a period of 48 hours.

3.—Oil of neroli, 1 gram; oil of lemon, 4 grams; oil of bergamot, 5 grams; oil of cedar, 1.5 grams; oil of lavender, 2 grams; oil of rosemary, 2 grams; melissa water (P. G.), 160 grams; alcohol, 1,000 grams.

4.—Oil of orange, 2.5 grams; oil of lemon, 3.5 grams; oil of bergamot, 1.5 grams; oil of neroli, 1.5 grams; oil of rosemary, 1.5 grams; alcohol, 370 grams.

5.—Oil of lemon, 350 grams; oil of bergamot, 270 grams; oil of lavender, 20 grams; oil of mint, 12 grams; oil of neroli, 6 grams; oil of white thyme, 5 grams; oil of rosemary, 5 grams; oil of rose, 1 gram; acetic ether, 12 grams; orange-flower water, 1,110 grams; rose water, 200 grams. Allow to macerate for 1 to 2 months, and then dilute with 6 to 8 kgm. of alcohol, and distil.

6.—Oil of bergamot, 12 grams; oil of neroli, 6 grams; oil of lemon, 6 grams; oil of mace, 1 gram; oil of rosemary, 1 gram; alcohol, 960 grams.

7.—Oil of orange, 24 grams; oil of lemon, 24 grams; oil of bergamot, 1.5 grams; oil of neroli, 0.5 gram; oil of petit

### (Colognes)

grain, 0.5 gram; oil of rosemary, 0.5 gram; alcohol, 770 grams.

**Antiseptic Cologne.**—Eau de cologne, 8 fl.oz.; chloral hydrate, 2 dr.; alkaloid quinine, 10 gr.; pure carbolic acid, 30 gr.; oil of lavender, 20 drops. The *Medical Record* says this may be used on the handkerchief, the doctor holding it gently to the mouth while in the sick-room. Warranted to keep out bacillus tuberculosis; also, b. termo, b. elephantiasis A., and b. gonococci.

**Farina Cologne.**—1.—Oil of lemon, 2½ oz.; oil of bergamot, 2¼ oz.; fine oil of lavender, ½ oz.; oil of neroli, 2 dr.; extract of orange flower, 4 oz.; extract of musk, best, 4 oz.; extract of civet, ½ oz.; alcohol, 2 gal.; water, 3 pt.; extract of benzoin, 1 oz.

2.—Golden Farina Cologne.—Tincture of Canada snake root, 4 oz.; tincture of orris root, 12 oz.; oil of bergamot, 6 dr.; oil of lavender, 6 dr.; oil of lemon, 6 dr.; essence of musk, 1 dr.; oil of neroli, 1 dr.; oil of cinnamon, 1 dr.; oil of cloves, 1 dr.; orange-flower water, 8 oz.; cologne spirits, sufficient to complete 6 pt.

**Fragrant Cologne.**—Oil of bergamot, 3 oz.; oil of lemon, 1 oz.; fine oil of lavender, ¼ oz.; oil of cloves, ¼ oz.; oil of sandalwood, ½ oz.; alcohol, 2 gal.; water, 3 pt.

**German Cologne, Imitation.**—Deodorized alcohol, 800 parts; water, 120 parts; tincture of musk, 40 parts; extract of tuberose, 20 parts; oil of Canadian snake root, 9 parts; oil of rose geranium, 3 parts; oil of lavender, 3 parts; oil of sandal, 2 parts; oil of patchouly, 2 parts; oil of neroli, 1 part.

**Jockey Club Cologne.**—Farina cologne, 800 parts; extract of jockey club, 150 parts; tincture of musk, 25 parts; tincture of ambergris, 25 parts.

**Picsee-Lubin's Cologne, Imitation.**—Deodorized alcohol, 900 parts; extract of orange flowers, 50 parts; oil of citron, 15 parts; oil of sweet orange, 15 parts; oil of neroli petale, 9 parts; oil of bergamot, 5 parts; oil of neroli bigarade, 3 parts; oil of rosemary, 3 parts.

**Solid Perfume.**—Essence of bergamot, 1 oz.; essence of lemon, 1 oz.; oil of citronella, ½ oz.; oil of neroli, ½ oz.; oil of rosemary, 80 minims; oil of geranium, 10 minims. Mix.

**Ylang-Ylang Cologne.**—Farina cologne, 800 parts; extract of rose, 100 parts; tincture of ambergris, 40 parts; tincture of musk, 40 parts; tincture of vanilla, 10 parts; oil of ylang-ylang, 8 parts; oil of neroli petale, 2 parts.

## Toilet Preparations—Perfumes

### (Coloring Materials)

#### Coloring for Colognes and Toilet Waters.

1.—Chlorophyll may be employed for coloring alcoholic solutions of a green tint. This substance may be purchased, or it may be prepared as follows: Digest leaves of grass, nettles, spinach, or other green herb, in warm water until soft; pour off the water and crush the herb to a pulp. Boil the pulp for a short time with  $\frac{1}{2}\%$  solution of caustic soda, and afterward precipitate the chlorophyll by means of dilute hydrochloric acid; wash the precipitate thoroughly with water, press and dry it, and use as much for the solution as may be necessary.

2.—A tincture made from grass, as follows, may be employed: Lawn grass, cut fine, 2 oz.; alcohol, 16 oz. Put the grass in a wide-mouthed bottle, and pour the alcohol upon it. After standing a few days, agitating occasionally, pour off the liquid. The tincture can be used with both alcoholic and aqueous preparations.

3.—Among the anilines, spirit-soluble malachite green has been recommended.

4.—A purple or violet tint may be produced by using tincture of litmus, or ammoniated cochineal coloring. The former is made as follows: Litmus,  $2\frac{1}{2}$  oz.; boiling water, 16 oz.; alcohol, 3 oz. Pour the water upon the litmus, stir well, allow to stand for about an hour, stirring occasionally, filter, and to the filtrate add the alcohol.

5.—The aniline colors, "Paris violet," or methyl violet B, may be similarly employed. The amount necessary to produce a desired tint must be worked out by experiment. Yellow tints may best be imparted by the use of tincture of turmeric or saffron, fustic, quercitron, etc.

6.—*Green*.—Chlorophyll is a suitable agent for coloring liquid perfumes green. Care must be taken to procure an article freely soluble in the menstruum. As found in the market, it is prepared (in form of solutions) for use in liquids strongly alcoholic; in water or weak alcohol; and in oils. Aniline greens of various kinds will answer the same purpose, but in a trial of any one of these it must be noted that very small quantities should be used, as their tinctural power is so great that liquids in which they are incautiously used may stain the handkerchief. Color imparted by chlorophyll will be found fairly permanent, we think; this term is a relative one, and not too much must be expected. Colors which may suffer but little change by long exposure to diffused light may fade perceptibly by short exposure to the direct light of the sun.

### (Essences and Extracts)

Aniline colors vary in their permanence of course, being of varying composition.

#### Essences and Extracts.

1.—Alcohol, 90%, 1 pt.; essence of bergamot, 1 oz.

2.—Alcohol, 90%, 1 pt.; otto of santal 1 oz.

3.—Alcohol, 90%, 1 pt.; otto of French lavender,  $\frac{1}{2}$  oz.; otto of bergamot,  $\frac{1}{2}$  oz.; otto of cloves, 1 dr.

4.—Alcohol, 90%, 1 pt.; otto of lemon grass,  $\frac{1}{4}$  oz.; essence of lemon,  $\frac{1}{2}$  oz.

5.—Alcohol, 2 pt.; otto of petit grain,  $\frac{1}{4}$  oz.; otto of orange peel,  $\frac{1}{2}$  oz. Nearly all these perfumes will require to be filtered through blotting paper, with the addition of a little magnesia to make them bright.

*Acacia*.—1.—Esprit de fleurs d'acacia, simple, 7 fl.oz.; esprit de fleurs jasmin,  $1\frac{1}{2}$  fl.oz.; esprit de tuberoze,  $1\frac{1}{2}$  fl.oz.; essence of ambergris, finest pale, 1 fl.dr.; eau de fleurs d'oranges, 3 fl.oz.; rectified spirit,  $7\frac{1}{2}$  fl.oz. Mix. A favorite Italian perfume.

2.—Extract of acacia, 750 parts; extract of orange flowers, 120 parts; extract of jasmine, 60 parts; extract of tuberoze, 60 parts; tincture of ambergris, 10 parts.

*Almond (Amygdala Amara)*.—1.—Is a native of Persia, Syria and Barbary, and is cultivated in southern France and Italy. Almond spirit: Essential oil of almonds,  $2\frac{1}{2}$  fl.dr.; oil of bergamot,  $\frac{1}{2}$  fl.dr.; oil of cassia,  $\frac{1}{2}$  fl.dr.; essence royale,  $\frac{1}{2}$  fl.dr.; rectified spirit, 1 pt. Mix.

2.—Almond spirit: Oil of bitter almonds, 80 drops; deodorized alcohol, 16 oz. Procure the best cologne spirits or deodorized alcohol obtainable. Do not use common alcohol, as its odor is too strong and pungent for perfumers' use.

*Ambergris*.—1.—This substance, which is found floating in the sea, or is thrown up by the waves upon the shores of various countries, is now generally believed to be produced in the intestines of the sperm whale. The best gray ambergris is quite expensive, but is the only one worth buying.

2.—Essence.—Ambergris, 5 dr.; grain musk (Chinese, pure),  $1\frac{1}{2}$  dr.; essence d'ambrette (or purple sweet sultan), 1 qt. This produces the finest quality of the London West End and Paris houses.

3.—Extract.—Spirit of rose, 3 oz.; tincture of ambergris, 8 oz.; tincture of musk, 4 oz.; tincture of vanilla, 1 oz. Cost, about \$6 per pt. Where permanence is desired, this can be recommended.

## Toilet Preparations—Perfumes

### (Essences and Extracts)

4.—Tincture.—Ambergris, 2 dr.; powdered orris root, 2 dr.; deodorized alcohol, 16 oz. Grind the ambergris and orris in a mortar until reduced to a fine powder; transfer to a bottle, and add the alcohol. Macerate for 30 days, and filter through paper.

*Benzoin, Tincture of.*—Gum benzoin, in fine powder, 2 oz.; deodorized alcohol, 16 oz. Macerate for 30 days, and filter.

*Bergamot (Citrus Bergamia).*—1.—The oil is obtained in Italy, by expression, from the peel of the fruit. It should be kept in a dark place, and in a tightly corked bottle. If not well taken care of, it soon loses its green color, becomes cloudy from a deposit of resin, and acquires a turpentine smell. Care should be taken to preserve all oils as above directed.

2.—Essence of Bergamot.—The popular name of oil of bergamot. A spirituous essence may be made in a similar way to that of almonds.

*Bouquets.*—Essence. Bouquet. — 1.—Rose spirit, 4 oz.; ambergris tincture, 1 oz.; orris, 2 oz.; bergamot oil,  $\frac{1}{4}$  oz.; lemon oil,  $\frac{1}{8}$  oz.

2.—Rose spirit, 2 oz.; ambergris tincture, 2 dr.; orris tincture, 1 oz.; bergamot otto, 1 dr.; lemon otto, 15 minims.

3.—Oil of leaf geranium, 1 oz.; oil of Turkish geranium,  $\frac{1}{2}$  oz.; otto of rose, 1 dr.; extract of musk, 6 oz.; extract of tonka, 6 oz.; extract of orange flower, 5 oz.; extract of vanilla, 2 oz.; extract of civet, 1 oz.; alcohol, 1 gal.; water, 4 oz.

4.—Extract of musk, 2 oz.; extract of tuberose, 2 oz.; otto of rose, virgin, 1 dr.; otto of bergamot, 1 $\frac{1}{2}$  dr.; otto of neroli, super,  $\frac{1}{2}$  dr.; otto of verbena, true, 8 minims; otto of pimento, 10 minims; otto of patchouli, 3 minims; otto of red cedar wood, true,  $\frac{1}{2}$  dr.; otto of lavender, English, 12 minims; pure spirit, sufficient to make 4 pt.

5.—Bouquet d'Amour.—Esprits de rose, 2 oz.; jasmin, 2 oz.; violette, 2 oz.; cassie, 2 oz.; essences of musk, 1 oz.; ambergris, 1 oz. Mix, and if the liquid be not quite clear, add of strong alcohol, drop by drop, the least quantity sufficient to render it so. It may be filtered, but this should be avoided, as it occasions loss. A very agreeable perfume.

Bouquet de Caroline.—Add to recipe for Essence Bouquet 1 pt. of extract of neroli, costing same sum.

*Carnation Pink.*—Oil of cloves, 5 minims; essence of cassie, 4 oz.; essence of jasmine, 2 oz.; essence of orange flowers,

### (Essences and Extracts)

4 oz.; essence of rose, 8 oz.; tincture of vanilla, 2 oz.; tincture of storax, 1 oz.

*Cassie (Acacia Farnesiana).*—1.—Cassie is cultivated in southern France and Italy, and produces a very valuable perfume, resembling violets, but stronger.

2.—Essence of Cassie. Cassie pomade, 16 oz.; deodorized alcohol, q. s., or 16 oz. Introduce the pomade and alcohol into a Mason fruit jar of  $\frac{1}{2}$  gal. capacity. Digest by means of a water bath until the pomade is barely melted; shake well together, and repeat the shaking frequently until cold. Allow this to stand 30 days, then drain off the essence. If this falls short of 1 pt., repeat with a sufficient quantity of alcohol to make up that measure. The washing can be continued, and a second pint of essence obtained, which, although much weaker, may be found useful in a cheaper grade of perfumes.

*Cedar Wood, Lebanon.*—For the handkerchief. Otto of cedar, 1 oz.; rectified spirit, 1 pt.; esprit rose triple,  $\frac{1}{4}$  pt.

*Cherry Blossom.*—1.—Essence of peach blossom, 840 parts; essence of violet, 140 parts; essence of bitter almond (1 part of oil to 9 of alc.), 20 parts.

2.—Essence.—Extract of orange flowers (from pomade), 400 parts; extract of jasmine, 100 parts; essence of bitter almond (as above), 30 parts; tincture of balsam of Peru (1 to 9), 20 parts; oil of lemon, 20 parts; alcohol, 430 parts.

*Chypre.*—1.—English.—Extracts of jasmine, rose and tuberose, of each 2 kgrm.; tinctures of ambrette, 2 kgrm.; orris, 1 kgrm.; musk, 500; civet, 200; tonka, 300; benzoin, 500; vanilla, 100; oils of bergamot, 20; otto of rose, 50; patchouli, 10; sandalwood, 5; rose geranium, 15 grams.

2.—German. First extracts of jasmine, 2; rose, 2; tuberose, 4; tinctures of Abel musk, 1; orris, 2 kgrm.; musk, 500; civet, 200; coumarin, 5; heliotropine, 10; vanilla, 5; oils of bergamot, 20; roses, 20; patchouli, 10; sandalwood, 5; geranium de rose, 40 grams.

*Citronella (Andropogon Mardus).*—Oil of citronella is obtained by distillation from citronella grass, a native of Ceylon and India.

*Civet, Tincture of.*—Civet, 1 dr.; powdered orris root, 1 dr.; deodorized alcohol, 16 oz. Proceed as with the tincture of ambergris.

*Clover, White.*—Vanillin, 20 gr.; heliotropine, 20 gr.; coumarin, 20 gr.; tincture of storax,  $\frac{1}{2}$  oz.; tincture of civet,  $\frac{1}{2}$  oz.; tincture of orris, 1 oz.; otto of rose, 60 minims; oil of bergamot, 60 min-

## Toilet Preparations—Perfumes

### (Essences and Extracts)

ims; oil of neroli, 90 minims; extract of tuberose, 4 oz.; extract of jasmine, 8 oz.; oil of cloves, 5 minims; oil of bitter almonds, 5 minims; terpineol, 60 minims; rectified spirit, 8 fl.oz.; glycerine, 1 fl.dr.

*Cloves, Spirit of.*—1.—Oil of cloves, 4 dr.; deodorized alcohol, 16 oz.

2.—Mix clove otto, 20 minims; alcohol, 4 oz.

*Crab Apple Essence.*—Hyacinthine, 5 minims; crategine, 10 gr.; oil of ylang-ylang, 30 minims; volatile oil of nutmeg, 10 minims; oil of lignaleo, 20 minims; oil of wintergreen, 2 minims; musc Baur, 10 gr.; extract of cassie, 2 fl.oz.; extract of violet, 4 fl.oz.; tincture of orris, 1 fl.oz.; glycerine, 30 minims; extract of jasmine, 4 fl.oz.

*Elder Flowers, Extract.*—1.—Elder-flower water, 1 qt.; tincture of benzoin, 1 oz.

2.—Elder Blossom.—Spirit, 8,000; distilled water, 2,000; oil of ylang-ylang, 70; coumarin, 45; terpineol-muguet, 250; musc Baur, 5 grams.

*Flowers, Essences of.*—The essences of those flowers which are not separately given in this work may be made by one or other of the following general formulae: Essential oil of the respective flowers, 1 oz.; rectified spirit, 1 pt.

*Forest Flowers.*—Extract of orange flower, 320 parts; extract of tonquil, 160 parts; extract of acacia, 160 parts; extract of tuberose, 160 parts; extract of Spanish elder flower, 160 parts; tincture of benzoin, 30 parts; essence of ambergris, 5 parts; essence of musk, 5 parts.

*Frangipanni.*—1.—Oil of fine lavender,  $\frac{1}{2}$  oz.; oil of geranium leaf,  $\frac{1}{2}$  oz.; oil of Turkish geranium,  $\frac{1}{2}$  oz.; otto of rose, 1 dr.; extract of musk, 6 oz.; extract of tonka, 6 oz.; extract of sandalwood, 1 pt.; extract of vanilla, 2 oz.; extract of civet, 1 oz.; alcohol, 1 gal.; water, 8 oz.; extract of orange flower, 5 oz.

2.—Tuberose essence, 1 oz.; vitiver spirit,  $\frac{1}{2}$  oz.; sandal otto, 15 minims; rose otto, 15 minims; orange-flower otto, 15 minims; alcohol,  $\frac{1}{2}$  oz.; musk tincture, 2 oz.; orris tincture, 1 oz.; orange-flower essence, 1 oz.

*Geranium.*—Oil of geranium leaf, 2 oz.; oil of Turkish rose, 2 oz.; oil of bergamot, 1 oz.; extract of orange flower, 5 oz.; extract of civet, 1 oz.; alcohol, 1 gal.; water, 8 oz.

2.—Rose Geranium Extract.—Oil of rose geranium, 1 oz.; deodorized alcohol, 15 oz.

*Heliotrope.*—1.—Extract orange flower, 1 oz.; extract of white rose, 1 qt.; extract of vanilla,  $\frac{1}{2}$  pt.; extract of benzoin, 1

### (Essences and Extracts)

oz.; extract of civet, 1 oz.; alcohol, 1 pt.; oil of bitter almonds, 3 minims; water, 2 oz. If you will get the flower heliotrope, you will notice a slight odor of bitter almonds. Put into the extract only the amount required to imitate that.

2.—Tincture of vanilla, 600 parts; triple extract of rose, 250 parts; extract of orange flower, 100 parts; tincture of ambergris, 40 parts; concentrated essence of bitter almond, 10 parts.

3.—Heliotropine, 2.30 grams; vanillin, 0.40 gram; coumarin, 0.25 gram; tincture of musk, 2.50 grams; oil of ylang-ylang, 20 drops; geraniol, 10 drops; benzaldehyde, 2 drops.

*Honeysuckle Extract.*—Mix patchouly extract, 3 dr.; benzoin tincture,  $\frac{1}{2}$  oz.; rose essence,  $\frac{1}{2}$  oz.; clove spirit,  $\frac{1}{2}$  oz.; civet tincture, 1 oz.; orange-flower spirit, 1 oz.; jasmine essence, 4 oz.; vanilla tincture, 1 oz.

*Hyacinth.*—Geranyl acetate, 3 minims; essence of jasmine, 10 oz.; vanillin, 10 gr.; oil of neroli, 20 minims; hyacinthine, 25 minims; essence of ambrette, 1 oz.; coumarin, 20 gr.; essence of rose, 3 fl.oz.; glycerine, 4 dr.; rectified spirit to 25 fl.oz.

*India Perfume.*—Coumarin, 10 gr.; concentrated rose water, 1 to 40, 2 oz.; neroli oil, 5 minims; vanilla bean, 1 dr.; bitter-almond oil, 5 minims; orris root, 1 dr.; alcohol, 10 oz. Macerate for a month.

*Iris, White, Essence.*—Ionone, 3 minims; oil of orris, 10 minims; heliotropine, 30 gr.; terpineol, 60 minims; oil of ylang-ylang, 20 minims; oil of lignaleo, 5 minims; solution of amyl acetate, 10%, 5 minims; glycerine, 20 minims; essence of jasmine, to make 10 fl.oz.

*Japanese Perfume.*—Triple extract of rose,  $\frac{1}{2}$  pt.; extract of vitiver,  $\frac{1}{2}$  pt.; extract of patchouly,  $\frac{1}{2}$  pt.; extract of cedar,  $\frac{1}{2}$  pt.; extract of santal,  $\frac{1}{2}$  pt.; extract of verveine,  $\frac{1}{4}$  pt.

*Jasmine, Essence.*—1.—Jasmine pomade, 16 oz.; deodorized alcohol, q. s., or 16 oz. Proceed as with cassie.

2.—Extract.—Mix jasmine essence, 4 oz.; vanilla tincture,  $\frac{1}{2}$  oz.; ambergris tincture, 2 dr. Cost, \$2.24 per pt.

*Jessamine.*—Extract of jessamine from pomade, 8 pt.; oil of lemon,  $\frac{1}{2}$  oz.; oil of bergamot,  $\frac{1}{2}$  oz.

*Jockey Club.*—1.—Extract of jasmine, 5 oz.; extract of orris, 20 oz.; extract of musk, 7 oz.; extract of vanilla,  $\frac{1}{2}$  oz.; otto of rose, virgin,  $\frac{1}{2}$  dr.; otto of santal flav.,  $\frac{1}{2}$  dr.; otto of bergamot,  $\frac{2}{3}$  dr.; otto of neroli, super., 40 minims; benzoic acid, 2 dr.; pure spirit, sufficient

## Toilet Preparations--Perfumes

### (Essences and Extracts)

to make 4 pt. In this, as well as the following extracts, before adding the last portion of the spirit, replace as much of it with water as the perfume will bear without becoming milky, which will vary from 2 to 8 oz., or more. This addition will make the perfume softer.

2.—Extract. Mix tuberose essence, 2 oz.; rose spirit, 2 oz.; rose essence, 2 oz.; ambergris tincture, 1½ oz.; civet tincture, 2 dr.; musk tincture, 2 dr.; bergamot otto, 30 minims; clove otto, 10 minims.

*Jonquil, True Extract of.*—1.—Jonquil pomade, 8 lb.; spirit, 60 overproof, 1 gal. Let it stand one month.

2.—Imitation Extract.—Spirituous extract of jasmine pomade, 1 pt.; spirituous extract of tuberose, 1 pt.; spirituous extract of fleur d'orange, ½ pt.; extract of vanilla, 2 fl.oz.

*Lavender.*—1.—Essence.—Oil of lavender, Mitcham, 1 oz.; rectified spirit, strongest, ½ pt. Mix, with agitation, a few drops of the essences of musk and ambergris being added at will. Very fine.

2.—Extract.—Oil of lavender, Mitcham, 4 dr.; essence of rose, 2 oz.; deodorized alcohol, 14 oz.

3.—For Barbers.—a.—English oil of lavender, 3 oz.; oil of bergamot, 1½ oz.; essence of tonka beans (1 in 10), 1 oz.; rose water, 12 oz.; alcohol, 80 oz.

b.—Oil of lavender, 10 dr.; oil of bergamot, 1½ dr.; essence of musk (1 in 16), 2 dr.; oil of neroli, 4 drops; oil of rose geranium, 6 drops; oil of sandalwood, 7 drops; alcohol, 30 oz.; water, 30 oz.

*Lemon, Essence of.*—Oil of lemon, 4 dr.; carbonate of magnesia, 4 dr.; sugar, 4 dr.; deodorized alcohol, 8 oz.; water, 8 oz. Dissolve the oil in 2 oz. of alcohol; triturate in a mortar with the magnesia and sugar. Gradually add the remainder of the alcohol and water, and filter. This is also used for dispensing.

*Lilac.*—1.—Essence of jasmine and essence of rose, of each 5 fl.oz.; oil of ylang-ylang, 60 minims; heliotropine, 20 gr.; essence of tuberose, 10 fl.oz.; essence of civet, 1 dr.; terpineol, 6 fl.dr.; essence of ambrette, 1 fl.oz.; glycerine, 4 dr.; rectified spirit, to 25 fl.oz.

2.—White Lilac.—Extract of tuberose, 730 parts; extract of orange flower, 200 parts; essence of ylang-ylang, 35 parts; tincture of civet, 33 parts; essence of bitter almond, 2 parts.

*Lily of the Valley.*—1.—Extract of tuberose, 400 parts; extract of rose, 200 parts; extract of acacia, 200 parts; extract of orange flower, 100 parts; extract

### (Essences and Extracts)

of jasmine, 98 parts; concentrated essence of bitter almond, 2 parts.

2. Oil of lignaloe (synthetic), 6 grams; oil of neroli, 2 grams; oil of jasmine (synthetic), 1 gram; amyl butyrate, 20 drops; tincture of musk, 30 drops.

*Magnolia.*—Triple extract of rose, 500 parts; extract of orange flower, 250 parts; extract of tuberose, 125 parts; extract of violets, 122 parts; concentrated essence of bitter almond, 2 parts; concentrated essence of citron, 1 part.

*May Blossom.*—Essence of orris, 500 parts; triple extract of rose, 250 parts; extract of jasmine, 100 parts; essence of ylang-ylang, 100 parts; essence of ambergris, 25 parts; oil of orange, 10 parts; oil of citron, 20 parts; oil of neroli, 5 parts.

*Meadow Flowers.*—Tincture of tonka, 300 parts; essence of rose geranium, 300 parts; extract of rose, 200 parts; extract of orange flower, 100 parts; tincture of orris, 40 parts; extract of jasmine, 20 parts; extract of acacia, 20 parts; tincture of musk, 20 parts.

*Mignonette.*—Extrait cassia, 200 grams; extrait jasmin, 200 grams; extrait tuberose, 200 grams; extrait violet, 300 grams; extrait rose, 400 grams; extrait rose oil, 2 grams; rosemary oil, 6 grams; musk tincture, 120 grams; geranium oil, 5 grams.

*Millefleurs (Thousand Flowers).*—Spirit of rose, 3 oz.; essence of rose, 1 oz.; essence of jasmine, 4 oz.; essence of orange flowers, 2 oz.; essence of cassia, 2 oz.; tincture of orris, 2 oz.; tincture of tonka, 4 dr.; tincture of ambergris, 4 dr.; tincture of musk, 4 dr.; oil of bitter almonds, 3 drops; oil of neroli petale, 3 drops; oil of cloves, 3 drops; oil of bergamot, 120 drops.

*Musk, Tincture of.* Grain musk, 2 dr.; hot water, 1 oz.; deodorized alcohol, 15 oz. Rub the musk to a fine paste with the hot water. Digest in a covered mortar for 2 hours; add the alcohol, and transfer to a tightly corked bottle. Digest for 30 days, and filter.

*Myrtle, Imitation Essence of.* Extract of vanilla, ½ pt.; extract of roses, 1 pt.; extract of fleur d'orange, ½ pt.; extract of tuberose, ½ pt.; extract of jasmine, 2 oz.

*Narcissus, Essence of.*—Caryophyllin, 10 minims; extract of tuberose, 16 fl.oz.; extract of jasmine, 4 fl.oz.; oil of neroli, 20 minims; oil of ylang-ylang, 20 minims; oil of cloves, 5 minims; glycerine, 30 minims; solution of amyl acetate, 10%, 20 minims.

# *Toilet Preparations—Perfumes*

## (Essences and Extracts)

*Neroli Spirit*.—Oil of neroli petale, 4 dr.; deodorized alcohol, 16 oz.

*New Moon Hay*.—Tonka tincture, 4 oz.; musk tincture, 1 oz.; benzoin tincture, 1 oz.; rose spirit, 1 oz.; rose geranium oil, 40 minims; bergamot oil, 40 minims; rectified alcohol, 1 oz.

*Night-Blooming Cereus*.—Triple extract of rose, 250 parts; extract of jasmine, 250 parts; tincture of benzoin, 200 parts; extract of tuberose, 100 parts; tincture of tonka, 100 parts; tincture of ambergris, 100 parts.

*Opoponax*.—Extract of acacia, 270 parts; extract of tuberose, 270 parts; extract of jasmine, 200 parts; extract of violets, 80 parts; extract of rose, 60 parts; tincture of benzoin, 60 parts; tincture of musk, 60 parts.

*Orange*.—1.—Orange extract, 1,000 grains; jasmine extract, 120 grains; orange-flower water, 30 grains; bergamot oil, 8 grains; neroli oil, 15 grains; musk tincture, 10 grains.

2.—Orange Blossom.—Alcohol, 80°, 900 parts; tincture of musk, 60 parts; extract of jasmine, 20 parts; oil of neroli, 15 parts; oil of bergamot, 4 parts; oil of sweet orange, 1 part.

3.—Essence of Orange Flowers.—Orange-flower pomade, 16 oz.; deodorized alcohol, q. s., or 16 oz. Proceed as with cassia.

4.—Essence of Neroli, Essence of Orange Blossoms.—Pure neroli,  $\frac{1}{2}$  oz.; rectified spirit, 1 pt. Dissolve. An ounce of the essence of jasmine, jonquil or violets is often added. A delicate and delicious perfume.

5.—Orange-flower Extract.—Essence of orange flowers, 12 oz.; essence of cassia, 2 oz.; tincture of musk, 2 oz.

6.—Orange-flower Spirit.—Orange-flower otto, 40 minims; alcohol, 8 oz.

*Orris Tincture*.—1.—Powdered orris root, 2 oz.; alcohol, 4 oz. Macerate the orris root for 7 days, and filter; then percolate the orris root with alcohol sufficient to make the measure up to 4 fl.oz.

2.—Extract.—Seven pounds of finely ground orris root of good quality is treated by percolation with pure alcohol until 1 gal. of extract is obtained.

*Patchouly (Pogostemon Patchouli, Lindley)*.—1.—Patchouly is a native of Selhet, a district of Bengal. It is also found in Java, Ceylon and portions of China. The oil is distilled from the fresh herb. It has a very peculiar, musty, mossy odor, but when properly blended forms a very fashionable perfume.

2.—Oil of patchouly, 75 drops; oil of rose, 15 drops; deodorized alcohol, 16 oz.

## (Essences and Extracts)

3.—Otto of patchouly, 2 dr.; otto of santal flav., 40 minims; rose, virgin, 40 minims; extract of musk, 8 oz.; extract of orris, 8 oz.; extract of vanilla, 4 oz.; extract of styrax, 2 dr.; pure spirit, sufficient to make 4 pt.

4.—Mix patchouly otto, 2 dr.; rose otto, 20 minims; alcohol, 15 oz.

*Peach Blossoms, Essence of; Extract of Peach Blossoms*.—This name is fancifully given to the following preparation: Oil of lemon, recent, 1 fl.dr.; balsam of Peru, 15 gr.; essential oil of almonds, 8 gr.; spirit of orange flowers,  $2\frac{1}{2}$  fl.oz.; spirit of jasmine, 5 fl.dr.; rectified spirit, 7 fl.oz. Agitate them together for a few days, and after another week pour off the clear portion. A refreshing and powerful perfume, much esteemed for personal use. A second quality is made with spirit only 35% overproof.

*Pine Forest Perfume*.—Oil of pinus picea, 4 oz.; oil of lavender,  $\frac{1}{2}$  oz.; oil of bergamot,  $\frac{1}{2}$  oz.; oil of lemon,  $\frac{1}{2}$  oz.

*Pinks*.—1.—Clove Pink.—Extract of jasmine, 12 oz.; extract of orris, 12 oz.; extract of musk, 8 oz.; otto of rose, virgin, 1 dr.; otto of cloves, 2 dr.; otto of neroli, super, 1 dr.; otto of pimento, 10 minims; otto of patchouly, 20 minims; otto of santal flav., 2 dr.; benzoic acid, 1 dr.; pure spirit, sufficient to make 4 pt.

2.—Sweet Pink.—Oil of ylang-ylang, 1 dr.; oil of bergamot, 2 dr.; extract of benzoin, 2 dr.; civet, 2 dr.; extract of rose from pomade, 8 oz.; alcohol,  $1\frac{1}{2}$  qt.

*Pond Lily*.—Extract of tuberose, 400 parts; extract of acacia, 280 parts; extract of jasmine, 160 parts; extract of violets, 80 parts; tincture of vanilla, 78 parts; concentrated essence of bitter almond, 2 parts.

*Primrose*.—Extract of jasmine, 910 parts; oil of bergamot, 48 parts; oil of lemon, 16 parts; oil of petit grain, 16 parts; oil of cloves, 4 parts; tincture of ambergris, 6 parts.

*Rose (Rosa Centifolia)*.—1.—This is truly the queen of flowers; and although roses are found growing wild in nearly every part of the world, it is only in France, Turkey and India that they are cultivated for their perfume. The Turkish oil is the one commonly found in the market. Oil of rose should congeal at 80° F. When slowly cooled to 50° F. the oil becomes a transparent solid, interspersed with numerous slender, shining, iridescent scale-like crystals (U. S. P.). The oil is obtained by distilling the flowers with water.

2.—Essence of Rose.—a.—Rose po-

## Toilet Preparations—Perfumes

### (Essences and Extracts)

made, 16 oz.; deodorized alcohol, q. s., or 16 oz. Proceed as with cassia essence.

b.—Pure otto of roses, 1¼ dr. troy; alcohol (0.806), 1 pt. Mix. Place the bottle in a vessel of warm water until its contents acquire the temperature of about 85° F., then cork it close, and agitate it smartly until the whole is quite cold. Very fine.

c.—Red.—Concentrated tincture of roses: Red rose petale or leaves, dried 6 oz.; proof spirit, 1 qt. Digest for 14 days, press, strain, add of acetic acid (sp. gr. 1.044), 2 fl.dr., and the next day filter. Used chiefly to color and flavor cosmetics that do not contain alkalis or earths, particularly liquid ones made with spirit.

3.—Empress Augusta Victoria Rose.—Esprit de rose triple, 1 pt.; extract of rose No. 1, 2½ pt.; tincture of ambergris, ½ pt.; tincture of musk, ½ pt.; spirit of rose geranium oil (1 to 30), ½ pt.; oil of neroli, ½ fl.oz.; oil of rhodium, ¼ fl.oz. Mix, and filter. This odor is most remarkably fragrant.

4.—Esprit de Rose.—The compound perfume sold under this name is commonly made as follows: Esprit de rose (simple, finest), 1 pt.; essence of ambergris, ½ fl.dr.; oil of rose geranium, ½ fl.dr. Mix. Delicately fragrant.

5.—Japan Rose Extract.—Extract of rose (2d), 64 oz.; tincture of orris, 80 oz.; oil of rose, ½ oz.; oil of rose geranium, ½ oz.; oil of sandalwood, 2 dr.; oil of neroli, 1 dr.; glycerine, 5 oz.; alcohol, 64 oz.

6.—Marschal Niel.—In the genus of roses, outside of the hundred-leaved or cabbage rose, the Marschal Niel rose (Rosa Noisetteana Red), also called Noisette rose, and often, erroneously, tea rose, is especially conspicuous. Its fine, piquant odor delights all lovers of precious perfumes. In order to reproduce the fine scent of this flower artificially, at periods when it cannot be had without much expenditure, the following receipt will be found useful: Infusion rose I (from pomades), 1,000 grams; genuine rose oil, 10 grams; infusion of tolu balsam, 150 grams; infusion of genuine musk I, 40 grams; neroli oil, 30 grams; clove oil, 2 grams; infusion of tuberose I (from pomades), 1,000 grams; vanillin, 1 gram; coumarin, 0.5 gram.

7.—Moss Rose.—Triple extract of rose, 630 parts; extract of orange flower, 200 parts; tincture of ambergris, 100 parts; tincture of musk, 70 parts.

8.—Spirit of Rose.—Oil of rose, 2 dr.; oil of rose geranium, 1 dr.; deodorized al-

### (Essences and Extracts)

cohol, 16 oz. The oil of rose geranium is added to give permanence to the spirit.

9.—Tea Rose.—Essence of rose, 4 oz.; spirit of rose, 8 oz.; spirit of santal, 2 oz.; essence of orange flowers, 1 oz.; tincture of orris, 1 oz.; oil of rose geranium, 20 drops.

10.—Wild Rose.—Extract of rose, 550 parts; extract of acacia, 150 parts; extract of orange flower, 150 parts; triple extract of rose, 116 parts; oil of neroli pet., 2 parts; oil of verbenia, 2 parts.

*Sandalwood Extract.* Otto of sandalwood, 3 dr.; otto of rose, 20 minims; alcohol, 8 oz.

*Santal (Santalum Album).*—1.—The oil is distilled from the wood, which is a native of Australia and the South Sea Islands.

2.—Spirit of Santal.—Oil of sandalwood, 2 dr.; deodorized alcohol, 16 oz.

*Solid or Frozen Perfumes.*—In the first place, the solid perfume is merely perfumed hard paraffine. The hard paraffine is melted and perfumed at as low a temperature as possible, and for a mold use the lids of 2 dr. chip boxes.

1.—Bouquet Solid Perfume. Oil of coriander, 18 minims; oil of cloves, 2 dr.; oil of nutmeg, 1 dr.; oil of lavender, 3 dr.; oil of sandal, 1 dr.; oil of bergamot, 1 oz.; otto of rose, ½ dr.; oil of geranium, ½ dr.; oil of orange, 10 minims. Mix.

2.—Cologne Solid Perfume. Essence of bergamot, 1 oz.; essence of lemon, 1 oz.; oil of citronella, ½ oz.; oil of neroli, ½ oz.; oil of rosemary, 80 minims; oil of geranium, 10 minims. Mix.

3.—Lavender Solid Perfume.—Oil of lavender, 2 oz.; essence of bergamot, 1 oz.; oil of cassia, 5 minims; oil of geranium, 40 minims; oil of orange, 5 minims. Mix, and perfume the wax as before.

4.—White Rose Solid Perfume. Oil of geranium, ½ dr.; oil of bergamot, ½ dr.; oil of patchouli, 5 minims.

*Spring Flowers.*—Rose extract, 500 grams; violet extract, 500 grams; rose oil, 5 grams; cassia extract, 70 grams; bergamot oil, 8 grams; amber essence, 25 grams.

*Stephanotis.*—Extracts of orange, 1 kgm.; rose, 1 kgm.; jasmine, ½ kgm.; cassia, ½ kgm.; tinctures of orris, ½ kgm.; musk, 20 grams; oils of roses, 5 grams; lemon, 1 gram.

*Styrax Extract.*—Styrax balsam, 8 dr., dissolved in alcohol, 1 pt.

*Succet Brier.*—Triple extract of rose, 670 parts; extract of acacia, 160 parts; extract of orange flower, 160 parts; oil



## Toilet Preparations—Perfumes

### (Essences and Extracts)

of neroli petale, 5 parts; oil of verbenia, 3 parts.

**Sweet Pea.**—Extract of tuberose, 320 parts; extract of rose, 320 parts; extract of orange flower, 320 parts; tincture of vanilla, 40 parts.

**Tropical Flowers.**—Extract of jasmine, 300 parts; extract of orange flower, 150 parts; extract of acacia, 100 parts; extract of jonquil, 100 parts; extract of vanilla, 100 parts; extract of tuberose, 100 parts; extract of Spanish elder flower, 100 parts; extract of reseda, 30 parts; oil of bergamot, 10 parts.

**Tuberose (*Paleanthes Tuberosa*).**—The tuberose is a native of the East Indies. It is cultivated for its perfume in southern France. Its odor is very fine, and is a general favorite.

1.—Essence of Tuberose.—Tuberose pomade, 16 oz.; deodorized alcohol, q. s., or 16 oz.

2.—Essence of Tuberose.—The *extrait triple* of the flowers, or a still stronger *extrait*, prepared with rectified spirit, or a spirit of much greater strength than that usually employed for *extraits*. It is nearly colorless, but when required white, or of still greater strength, the *extrait triple* is submitted to distillation by the heat of a water bath, the process being conducted as rapidly as possible, and the first half, or two-thirds, that comes over, being separately collected as the essence. In general, however, unless the process be very skillfully conducted, the odor of the distilled essence, though stronger, is scarcely so chaste and delicate as that of the *extrait* from which it has been prepared. In a similar way to *essence de tuberose*, the finer qualities of essences of honeysuckle, jasmine or jessamine, jonquil, May blossom, May lily, myrtle blossoms, narcissus, orange flowers, roses, violets, wallflowers and of other flowers of extremely delicate perfume, are usually obtained by the Continental manufacturing perfumers; as also of essence of cassia, vanilla, etc., except that the second is not distilled.

**Tulip.**—1.—Extract of tuberose, 380 parts; extract of violets, 380 parts; extract of rose, 180 parts; tincture of orris, 58 parts; essence of bitter almond, 2 parts.

2.—Extract of tuberose, extract of violet, extract of jasmine, from pomade of each, 1 pt.; extract of rose,  $\frac{1}{2}$  pt.; extract of orris, 3 oz.; otto of almonds, 3 drops.

**Verbena.**—1.—Oil of lemon grass, 50 drops; oil of lemon, 320 drops; oil of neroli petale, 20 drops; oil of orange, 160

### (Essences and Extracts)

drops; essence of orange flowers, 3 oz.; essence of tuberose, 3 oz.; spirit of rose, 3 oz.; deodorized alcohol, 6 oz.

2.—Oil of lemon grass, 3 dr.; oil of lemon,  $\frac{1}{2}$  oz.; alcohol, 16 oz.

3.—Alcohol, 80°, 970 parts; oil of lemon, 20 parts; oil of lemon grass, 5 parts; oil of orange, 5 parts.

**Vervecine, *Extract de.***—Alcohol, 1 pt.; otto of orange peel, 1 oz.; otto of lemon peel, 2 oz.; otto of citron zeste, 1 dr.; otto of lemon grass,  $2\frac{1}{2}$  dr.; extract of fleur d'orange, 7 oz.; extract de tuberose, 7 oz.; esprit de rose,  $\frac{1}{2}$  pt. This mixture is exceedingly refreshing, and is one of the most elegant perfumes made. Being white, it does not stain the handkerchief.

**Victoria.**—Otto of rose, virgin, 2 dr.; otto of neroli, super, 2 dr.; otto of bergamot, 4 dr.; otto of coriander, 16 minims; otto of pimento, 24 minims; English otto of lavender, 16 minims; extract of jasmine, 2 oz.; extract of orris, 16 oz.; extract of musk, 2 oz.; benzoic acid, 2 oz.; pure spirit, sufficient to make 4 pt.

**Violets.**—1.—Essence.—a.—Violet pomade, 16 oz.; deodorized alcohol, q. s., or 16 oz. Proceed as with cassie essence.

b.—Extract of violet from pomade, 4 pt.; extract of orris, 4 pt.; extract of orange flower, 2 oz.; extract of cassie, 2 oz.; extract of ylang-ylang, 1 dr.; otto of rose, Kissanlik,  $\frac{1}{2}$  dr.; civet, 1 oz.; bergamot, 1 dr.; water, 4 oz.

c.—No. 1 ylang-ylang, 1 pt.; extract of cassie, from pomade, 8 oz.; extract of civet, 2 oz.; extract of vanilla, 4 oz.; extract of orris, 1 pt.; alcohol, 2 gal.; water, 3 pt.

2.—Extract.—a.—Violet essence, 4 oz.; cassie essence, 1 oz.; rose essence, 3 dr.; orris tincture, 1 oz.; ambergris tincture, 2 dr.; civet tincture, 2 dr.; almond spirit, 20 minims.

b.—Extract of orris, 2 pt.; extract of tuberose, 4 oz.; extract of vanilla, 3 oz.; extract of musk, 3 oz.; extract of tonka, 2 oz.; otto of rose, virgin, 1 dr.; otto of neroli, super, 40 minims; otto of pimento, 12 minims; otto of bergamot, 1 dr.; benzoic acid, 1 dr.; pure spirit, sufficient to make 4 pt.

3.—Alpine Violet.—Extract of violets, 640 parts; tincture of orris, 160 parts; extract of acacia, 120 parts; extract of rose, 40 parts; tincture of ambergris, 38 parts; concentrated essence of bitter almond, 2 parts.

4.—Parma Violet.—Ionone solution, 3 dr.; tincture of benzoin, 2 dr.; oil of bitter almond, 10 minims; oil of neroli, 10 minims; essence of jasmine, 1 oz.; tinc-

## Toilet Preparations—Perfumes

### (Essences and Extracts)

ture of orris, 1 oz.; alcohol, 60%, 16 oz.; water, 4 oz.

5.—White Violet. Essence of.—Ionone, 60 minims; musc Baur, 10 gr.; essential oil of orris, 10 minims; extract of violet, 18 fl.oz.; extract of rose, 2 fl.oz.; oil of sweet orange, 5 minims; oil of lignaloe, 5 minims; solution of amyl acetate, 5 minims; heliotropine, 30 gr.; terpineol, 5 minims; solution of oil of patchouli (1 in 10), 20 minims; glycerine, 30 minims.

6.—Wood Violet.—a.—Extract of violets, No. 2, 16 oz.; oil of bitter almonds, 15 drops.

b.—Extract of orris, 12 oz.; extract of tuberose, 2 oz.; extract of jasmine, 1 oz.; extract of musk, 4 oz.

c.—Extract of violet, 1, 800 gr.; extract of rose, 1, 1,100 gr.; tincture of orris (1:50), 100 gr.; oil of bitter almond, 3 gtt.

*Vitiver Spirit*.—Mix vitiver otto, 30 minims; alcohol, 4 oz.

*Wallflowers*.—Triple extract of rose, 260 parts; extract of orange flower, 260 parts; extract of acacia, 120 parts; tincture of vanilla, 120 parts; tincture of orris, 120 parts; essence of bitter almond, 120 parts.

*Wild Flowers*.—Triple extract of rose, 350 parts; tincture of tonka, 180 parts; extract of violets, 90 parts; extract of acacia, 90 parts; extract of orange flower, 90 parts; extract of tuberose, 90 parts; tincture of musk, 90 parts; oil of citron, 20 parts.

*Wintergreen*.—Triple extract of rose, 360 parts; extract of acacia, 160 parts; essence of neroli petale, 160 parts; tincture of vanilla, 80 parts; tincture of vitiver, 80 parts; tincture of ambergris, 80 parts; essence of lavender, 80 parts.

*Ylang-ylang*.—1.—Ylang-ylang oil, 4 parts; rose geranium oil, 2 parts; musk extract, 15 parts; coumarin, 2 parts; rose oil, 1 part; sandalwood oil, 1 part; clove oil, 1 part; glycerine, 50 parts; paraffine, 2,000 parts.

2.—Ylang-ylang otto, 10 minims; neroli otto, 5 minims; rose otto, 5 minims; bergamot otto, 3 minims; grain musk, 1 gr.; 90% alcohol, 10 fl.oz. Mix, and digest for a fortnight. More delicate than the preceding, but always popular.

3.—Ylang-ylang Otto.—Obtained from the flowers of the canang tree of the Moluccas, the alangulian of China, *Mona odorata* (N. O. Anonaceae). The word ylang-ylang, in the Tagal dialect, signifies the "flower of flowers." Numerous other species of the various genera belonging to the Anonads produce powerful and delicious odoriferous seeds and flowers.

### (Fumigating Paper)

These are much esteemed by the Malayan women for making pomade, with which they anoint their bodies. They also wreath chaplets with the flowers for ornamenting their hair, and with them they erect triumphal arches in their marriage ceremonies.

#### Fumigating Paper.

1.—Oriental.—Clove oil, 30 grams; cinnamon oil, 36 grams; bergamot oil, 48 grams; lavender oil, 48 grams; tincture of benzoin, 420 grams; or Peru balsam, 15 grams; oils of clove and bergamot, of each 30 grams; acetic ether, 30 grams; tincture of musk, 6 grams; tincture of vanilla, 60 grams; tincture of benzoin, 160 grams; oil of cedar, 30 grams.

2.—Benzoin, 1 av.oz.; storax, ½ oz.; fumigating essence, 2 fl.oz.; ether, 1 fl.oz.; acetic acid, glacial, 20 drops; alcohol, 2 fl.oz. Dissolve the benzoin and storax in a mixture of the alcohol and ether, filter, and add the fumigating and the acetic acid. Spread the mixture upon filtering or bibulous paper, and allow it to dry. To prevent sticking, dust the surface with talcum, and preserve in wax paper. When used, the paper is simply warmed, or over a lamp.

3.—English.—Benzoin, 150 grams; sandalwood, 100 grams; frankincense, 100 grams; vitiver, 50 grams; Raygras, 10 grams; alcohol, 1 l.

4.—Russian.—Tincture of benzoin, 250 grams; musk, 10 grams; oils of clove, 5 grams; lavender, 5 grams; rose, 5 grams; geranium, 10 grams; and violet, 5 grams.

*Pastiles*.—These scent tablets consist of a compress mixture of rice starch, magnesium carbonate and powdered orris root, saturated with heliotrope, violet or lilac perfume.

1.—Benzoin, 1 dr.; cascarrilla, ½ dr.; myrrh, 20 gr.; oil of nutmeg, oil of cloves, of each 10 drops; saltpeter, 30 gr.; charcoal, 6 dr. Mix with mucilage of tragacanth.

2.—Benzoin, 2 oz.; balsam of tolu, yellow sandalwood, of each 4 dr.; labdanum, 1 dr.; saltpeter, 2 dr.; charcoal, 6 oz. Mix with mucilage of acacia.

3.—Heliotrope.—Heliotrope, 200 parts; vanillin, 50 parts; tincture of musk, 100 parts; tincture of benzoin, 200 parts.

4.—Lilac.—Terpineol, 200 parts; muguet, 200 parts; tincture of musk, 200 parts; tincture of benzoin, 200 parts; sandalwood, 2 dr.; vitiver, 2 dr.; lavender flowers, 4 dr.; oil of thyme, ½ dr.; charcoal, 2 oz.; potassium nitrate, ½ oz.; mucilage of tragacanth, a sufficient quantity.

## Toilet Preparations—Perfumes

### (Potpourri)

5.—Violet.—Ionone, 50 parts; ylang-ylang oil, 50 parts; tincture of musk, extra strong, 200 parts; tincture of benzoin, 200 parts.

**Powder.**—Fumigating powder is of similar composition to the pastiles, and is employed for the same purpose. It is in the form of coarse powder, free from any fine powder as well as from large, coarse pieces, and is of variegated brilliant colors, which are often produced by the use of aniline colors dissolved in alcohol, and different portions separately tinted, or sawdust is thus colored and added to the aromatics. Benzoin, 240 gr.; tolu balsam, 240 gr.; storax, 60 gr.; alcohol, 4 fl.oz.; Peru balsam, 60 gr.; oil of cinnamon, 4 drops; oil of lavender flowers, 4 drops. Mix the benzoin, tolu and storax with the alcohol, agitate occasionally, for several days, filter, and add the other ingredients. Moisten clean pine sawdust with this liquid.

**Vinegar.**—Fumigating tincture, 3 1/4 fl.oz.; acetic ether, 1 1/2 fl.oz.; acetic acid, 3 fl.oz. Mix, and after standing in a cool place for a few days filter. In fumigating sick-rooms, the vinegar is vaporized, either by heating it in a spoon or by pouring it upon a hot iron.

### Incense.

1.—Olibanum, in small tears, 1 lb.; benzoin, in coarse powder, 1 1/2 oz.; cascarilla bark, in coarse powder, 1 oz.; styrax calamita, 1/2 oz. Mix.

2.—Olibanum, 1 1/4 lb.; benzoin, 6 oz.; cascarilla bark, 5 oz.; cassia bark, 2 oz.; cloves, 2 oz. Mix.

### Potpourri, How to Make.

1.—The never-failing delight of a rose (or potpourri) jar is known only to its fortunate possessor; yet it is so easy to prepare one, and, once prepared, so easy to keep it at the point of perfection, that the wonder is they are not more frequently enjoyed. The flowers should be gathered in the early morning, and tossed lightly on a table in a cool, airy place, to lie till the dew has evaporated; then put them in a large glass jar, sprinkling salt over 1/2-in. layers of the flowers. This can be added to from morning to morning till enough flowers for the purpose have been gathered, letting them stand in the jar for 10 days after the last are put in, stirring the whole every morning. Have ready 1/2 oz. of mace and 1/2 oz. of allspice and cloves, all coarsely ground—or pounded in a mortar—half of a grated nutmeg, 1/2 oz. of cinnamon, broken in bits, 1 oz. of powdered orris root, and

### (Sachet Powders)

1/4 lb. of dried lavender flowers. Mix these together in a bowl, and proceed to fill the rose jar with alternated layers of the "stock" and the mixture of spices, etc. A few drops each of several essential oils—rose, geranium, bitter almond and orange flower are good—should be dropped upon the layers as you progress, and over the whole pour 1 oz. of your favorite toilet water or eau de cologne. This is sufficient to fill two quart jars, or one very large one, and it will keep for years. From time to time various sweet things may be added to it, as a few tuberose or a spray of heliotrope. If the jar be left open for a half hour every day it will fill your rooms with a delicate, indefinable spicy fragrance, very refreshing, and delightful, and unlike any other perfume. The flowers chosen should be those having agreeable perfume—roses, pinks, violets, verbenas, heliotrope, acacia, balm, lavender, etc.

2.—This is a mixture of dried flowers and spices not ground. Dried lavender, 1 lb.; whole rose leaves, 1 lb.; crushed orris, coarse, 1/2 lb.; broken cloves, cinnamon, allspice, each 2 oz.; table salt, 1 lb.

3.—Lavender flowers, 1 lb.; rose leaves, 1 lb.; cloves, 1/4 lb.; cinnamon, 1/4 lb.; benzoin, 1/4 lb.; pimento, 1/4 lb.; common salt, 2 1/2 lb.; oil of lavender, 60 minims; oil of santal, 60 minims; oil of geranium, 60 minims; oil of bergamot, 120 minims; oil of lemon, 60 minims; vanilla, 3 oz.; musk pods, 1 oz.; essence of ambergris, 1/2 oz. Solids all ground.

4.—Potpourri, for mixing with rose leaves.—Tonka bean, 1/2 part; cinnamon, pimento, 1 oz. of each; coriander, 4 oz.; benzoin, 5 oz.; orris root, 1 lb. Reduce to powder, mix, add 1/2 oz. of essence of bouquet toward end.

### Programs, etc., Perfuming of.

Coumarin, vanillin, heliotropine, of each 10 gr.; ionone, 10 minims; hyacinthine, 5 minims; essence of musk, 30 minims; otto of rose, 5 minims; absolute alcohol, 1 fl.oz. Distribute evenly on blotting paper. Place this in a closed tin box with the programs for 24 hours or so. It is almost inexhaustible.

### Sachet Powders.

The material is either to be ground in a mill or powdered in a mortar, and afterward sifted.

1.—The following recipe for scent powder, to be used for wardrobes, boxes, etc., gives an article far superior to the mixtures sold in the shops: Coriander, 1 oz.; orris root, 1 oz.; rose leaves, 1 oz.; aro-

## Toilet Preparations—Perfumes

### (Sachet Powders)

matic calamus, 1 oz.; lavender flowers, 2 oz.; rhodium wood,  $\frac{1}{4}$  dr.; musk, 5 gr. These are reduced to a coarse powder. The scent on the clothes is as if all fragrant flowers had been pressed in their folds.

2.—Take of reindeer moss, in coarse powder, any quantity, and very strongly scent it with any of the compound fragrant essences, or with the perfumes of which they are made, or with mixed essential oils, at will.

3.—Orris root, in coarse powder, 2 oz.; cassia, in coarse powder,  $\frac{1}{2}$  oz.; cloves, in coarse powder, 1 oz.; cedar wood, rasped,  $\frac{1}{4}$  oz.; yellow sandalwood, rasped,  $\frac{1}{4}$  oz.; ambergris, in fine powder, 5 or 6 gr.; musk, in fine powder, 5 or 6 gr.; mix, and add of oil of lavender (Mitcham), 1 dr.; oil of bergamot, 1 dr.; otto of roses, 10 to 15 drops. Blend the whole thoroughly together.

4.—*Acacia Sachet*.—Cassie flower heads, 1 lb.; orris powder, 1 lb.

5.—*Frangipanni*.—Violet roots, powdered, 3 lb.; sandalwood, powdered,  $\frac{1}{4}$  lb.; orange oil, 1 dr.; rose oil, 1 dr.; oil of sandalwood, 1 dr.; pulverized musk, 1 oz.; pulverized civet, 2 dr.

6.—*Heliotrope*.—Powdered orris root, 2,000 parts; powdered rosa centifolia, 1,000 parts; powdered tonka bean, 500 parts; cut vanilla bean, 250 parts; powdered musk, 10 parts; essential oil of bitter almonds, 1 part. Pound the musk and vanilla bean together, and add the rest. Pass through a not close sieve. This is an excellent imitation of heliotrope.

7.—*Lavender*.—This and the two following recipes are from Piesse. Powdered lavender, 75 parts; powdered benzoin, 20 parts; essential oil of lavender, 1 part. Mix.

8.—*Linon Sachet for Perfuming*.—Orris root, 125 parts; rosa centifolia, 125 parts; nutmegs, 8 parts; grain musk (*Hibiscus abelmoschus*), 15 parts. Powder coarsely, and mix.

9.—*Maréchal*.—Sandalwood, 280 parts; orris root, 280 parts; rosa centifolia, 140 parts; cloves, 140 parts; cassia bark (*Laurus cassia*), 140 parts; musk, 1 part. Powder coarsely.

10.—*New Mown Hay*.—a.—Ground rose leaves,  $1\frac{1}{2}$  lb.; ground orange flowers,  $\frac{3}{4}$  lb.; ground orris root,  $1\frac{1}{2}$  lb.; ground benzoin,  $\frac{1}{4}$  lb.; ground tonka bean,  $\frac{3}{4}$  lb.; ground ambrette,  $\frac{3}{4}$  lb.; oil of verberna,  $1\frac{1}{2}$  dr.; oil of almonds, 3 dr.

b.—Powdered orris, 4 lb.; ground tonka bean,  $\frac{1}{2}$  lb.; ground vanilla,  $\frac{1}{4}$  lb.; oil of almond, 10 minims; oil of French geranium, 120 minims; otto of rose, 30

### (Smelling Salts)

minims; oil of bergamot, 60 minims; extract of musk,  $1\frac{1}{2}$  minims.

11.—*Patchouly Sachet*.—Patchouly herb, ground, 16 lb.; otto of patchouly,  $\frac{1}{4}$  dr.

12.—*Rose Powder*.—a.—Pulverized rose leaves, 1 lb.; pulverized sandalwood,  $\frac{1}{2}$  lb.; rose oil, 2 dr.

b.—Rose leaves, 1 lb.; sandalwood, ground,  $\frac{1}{2}$  lb.; otto of roses,  $\frac{1}{4}$  oz.

13.—*Verbena Powder*.—Dried and pulverized lemon peels, 1 lb.; caraway seeds,  $\frac{1}{4}$  lb.; oil of lemon peels, 4 dr.; oil of bergamot, 1 oz.

14.—*Vervaine Sachet*.—Lemon peel, dried and ground, 1 lb.; lemon thyme,  $\frac{1}{4}$  lb.; otto of lemon grass, 1 dr.; otto of lemon peel,  $\frac{1}{2}$  oz.; otto of bergamot, 1 oz.

15.—*Violet Powder*.—a.—Powdered starch or potato farina, 28 lb.; orris powder, 1 lb. This will require about 1 oz. of perfume, varying according to fancy. A mixture of ambergris and bergamot, with a little musk, is a favorite odor, and some makers add a few drops of oil of rhodium. The powder should be sifted.

b.—Sachet.—Black currant leaves, 1 lb.; cassia-flower heads, 1 lb.; rose leaves, 1 lb.; orris-root powder, 2 lb.; otto of almonds,  $\frac{1}{4}$  dr.; grain musk, 1 dr.; gum benzoin, in powder,  $\frac{1}{2}$  lb. Mix the ingredients well by sifting. Let them stand for a week in a glass jar before using.

c.—Perfume for Violet Powder.—Bergamot oil, 20 parts; lemon oil, 20 parts; clove oil, 10 parts; neroli, 10 parts. Use equal parts of powdered orris root and starch, and add 1 dr. of this to each pound of powder.

### Smelling Salts. (See also Menthol Preparations.)

1.—Water of ammonia, 2 oz.; oil of lemon, 7 drops; oil of lavender, 2 drops; oil of bergamot, 4 drops. Ammonium carbonate, a sufficient quantity. Sift out the very fine and the very coarse pieces of the ammonium salt, using only those which are of nearly uniform size. Use as many of these as will go into the bottle, and fill with a mixture of the other articles.

2.—Water of ammonia, 4 oz.; oil of rosemary, 15 minims; oil of lavender, English, 15 minims; oil of bergamot, 8 minims; oil of cloves, 8 minims. Pieces of sponge are placed in a bottle and saturated with this mixture.

3.—Preston salt is a mixture of ammonium chloride and freshly slaked lime, to which a suitable perfume may be added. The mixture develops small amounts

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of ammonia continually until decomposition is complete, which is sometimes several years.

4.—Ammonium chloride,  $3\frac{1}{2}$  oz.; potassium carbonate,  $4\frac{1}{2}$  oz.; oil of lavender,  $\frac{1}{2}$  oz.; oil of lemon, 3 dr.; oil of cloves, 15 minims; oil of bergamot, 1 dr.; water of ammonia, a sufficient quantity. Triturate the chloride and carbonate well together; then add the oils, and finally enough water of ammonia to slightly moisten the mass.

*Antiseptic Smelling Salts*.—1.—Liquefied phenol, 1 fl.oz.; oil of eucalyptus, 1 fl.oz.; solution of iodine, 1 fl.oz.; strong solution of ammonia, 2 fl.oz. Mix.

2.—Ammonium carbonate, 360 gr.; camphor, 120 gr.; phenol, 480 gr.; oil of eucalyptus, 1 fl.dr.; oil of lavender, 1 fl.dr.; strong solution of ammonia, 2 fl.oz.; wood charcoal, a sufficient quantity to form a suitable mass. Mix.

*Eucalyptus Anti-Catarrh Smelling Salts*.—Ammonium carbonate, 1 lb.; strong solution of ammonia, 2 fl.oz.; oil of eucalyptus, 4 fl.dr.; oil of lavender, 1 fl.dr.; oil of peppermint, 2 fl.dr.

*Eucalyptus Smelling Bottle*.—Phenol, 120 gr.; oil of eucalyptus,  $1\frac{1}{2}$  fl.dr.; strong solution of ammonia, 4 fl.oz. Mix.

*White Smelling Salt*.—Mix in a capacious porcelain mortar 2.2 lb. of ammonium carbonate with 1.1 lb. of ammonia, cover the mortar, and let it stand quietly. In the course of a few days the contents will have been converted into normal carbonate of ammonium. The latter is reduced to a coarse powder, and perfumed with bergamot oil, 0.56 dr.; lavender oil, 0.9 dr.; nutmeg oil, 0.28 dr.; clove oil, 0.28 dr.; rose oil, 0.28 dr.; cinnamon oil, 2.82 dr. The incorporation of the volatile oils is effected by first triturating about one-tenth of the salt with the oils, and then gradually incorporating with this perfumed mass the rest of the salt. In this manner a uniform distribution of the odor is effected.

### Toilet Waters.

*Eau*, in perfumery, are either solutions of the fragrant essential oils, in spirit, with or without the addition of other fragrant substances; or they are distilled waters, largely charged with the odorous principles of flowers. *Eau de cologne*, *eau de lavande*, *eau de bouquet*, etc., are examples of the first; and *eau de rose*, *eau de fleurs d'oranges*, etc., of the second. The application of the term is usually restricted to articles of the kind imported from the south of France or Italy, and always so in reference to

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those of the latter class. English perfumers often give the name to perfumed spirits of their own manufacture, which, though generally greatly inferior to those imported, they pass off as foreign, or as made by foreign houses there. The *eaux* of the first class, just referred to, resemble, for the most part, the other esprits or perfumed spirits. They differ from *extraits* and most of the essences in being colorless, or nearly so, a quality which is secured either by distillation or by the use of only pure and pale essential oils and essences in their preparation. They also generally, but not always, possess less alcoholic strength, and are less highly charged with odorous matter than those preparations.

*Distilling Perfumed Waters*.—The still should have a high and narrow neck, to prevent the liquor in it from spurting over, and should be furnished with a steam jacket, or a bath should be used to prevent injury from excessive heat. Dry, hard or fibrous substances should be bruised, or otherwise mechanically divided and macerated in water before undergoing distillation. In almost all cases, salted or pickled flowers, herbs, etc., are superior to fresh ones. The product from them has little or none of the herbaceous and raw odor which is always present when fresh ones are used; besides which, the waters thus prepared keep better, and reach maturity, or the full development of their odor, in a much shorter time. Ebullition should be attained as quickly as possible, and should be continuous; and the heat, when possible, be regulated by a thermometer. Waters distilled from plants are apt to have a smoky odor at first, even when the greatest care and precaution have been observed in their distillation; exposure for a short time to the air will remove this, after which they should be kept in closely stoppered bottles, and preferably in bottles containing only sufficient for probable use at one time; they should be entirely filled and closed airtight.

*Ammonia Water*.—1.—Distilled water, 5 pt.; liquid ammonia forte,  $2\frac{1}{2}$  pt.; French rose water, 5 oz.; soluble essence of orange, 7 dr.; soluble essence of lemon, 7 dr.; soluble essence of neroli, 6 dr.; soluble essence of bergamot, 2 dr.; soluble essence of rosemary, 2 dr. Mix the essences with the distilled and rose water, and then add the ammonia.

2.—Stronger water of ammonia, 6 oz.; lavender water, 1 oz.; soft soap, 10 gr.; distilled water, enough to make 16 oz.

3.—Soft soap, 1 oz.; borax, 2 dr.; eau de cologne,  $\frac{1}{2}$  oz.; stronger water of am-

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### (Toilet Waters)

monia, 5½ oz.; water, enough to make 42 oz. Rub up the soap and borax with water until dissolved; strain, and add the other ingredients. The perfume may be varied to suit the price.

4.—Sodium carbonate, 20 oz.; water of ammonia, 48 oz.; water, 32 oz. Mix. Allow to stand 2 or 3 days, and then decant the clear solution, and bottle.

5.—A Cloudy Preparation.—Potassium carbonate, 1 part; borax, 1 part; green soap, 1½ parts; stronger water of ammonia, 4 parts; distilled water, 8 parts. Heat the water, and dissolve in it the soap and potassium carbonate; then add the borax, and, when cold, the stronger water of ammonia. If a cheap odor is desired, the preparation may be perfumed with oil of mirbane.

6.—Violet Ammonia.—a.—Ammonia water, 8 oz.; rose water, 8 oz.; powdered orris, 1 oz.; color, enough. Macerate the orris in a mixture of the two waters for a week, and then so filter the solution as to prevent evaporation of the ammonia. Finally, add the color.

b.—Ammonia water, 8 oz.; green soap, 4 oz.; oleic acid, 3 dr.; oil of bay, 15 minims; oil of rosemary, 15 minims; oil of varbena, 15 minims; water, enough to make 2 pt. Dissolve the soap in 1 pt. of water, by the aid of heat. When the solution has cooled add the other things, the oleic acid next to last, the balance of the water being last, of course.

c.—Stronger ammonia water, 6 pt.; alcohol, 1 pt.; oil of orris, 2 dr.; oil of bergamot, 2 dr.; water, enough to make 5 gal.; color, enough. Mix the ammonia water with a goodly portion of the water; dissolve the oils in the alcohol; mix the two liquids, and add the remainder of the water.

d.—Coloring Material.—Water-soluble chlorophyll may be used to give a green color to these mixtures, but it will precipitate, in part, after a while. An aqueous solution of litmus may be used to impart a violet color. Another green color, which should be used cautiously, if at all, may be made of copper sulphate, 1 oz.; potassium bichromate, 1 oz.; ammonia water, 8 oz.; water, 16 oz. Dissolve the salts separately in portions of the water, mix, and add the ammonia water.

*Aromatic or Perfumed Waters.*—The finest of these, such as are generally used by perfumers, are prepared by distillation, and are strictly pure water impregnated with the odoriferous principles of the plant or substance from which they are distilled. Those in use for pharma-

### (Toilet Waters)

ceutical purposes are, generally, solutions of these principles, chiefly the essential oils, in distilled water, usually prepared by trituration with the water, by means of some suitable intermedium, and then filtered.

*Carbolic Toilet Water.*—Crystallized carbolic acid, 10 parts; essence of millefleurs, 1 part; tincture of quillaya saponaria, 50 parts; water, 1,000 parts. Mix. The saponine replaces soap with advantage. The above should be employed, diluted with 10 times its bulk of water, for disinfecting the skin, for washing the hands after any risk of contagion, etc. The tincture of saponine in the above is made by taking of bark of quillaya saponaria, 1 part, and of alcohol, 90°, 4 parts. Heat to ebullition, and filter.

*Cosmetic Water, Viennese.*—This very economical and fragrant cosmetic is prepared as follows: Bruised almonds, 15 parts; water of orange flower, 62 parts; water of roses, 62 parts. Rub up the almonds with the waters, allow to stand, express, and add borate of soda, 1 part; spirit of benzoin, 2 parts. Dissolve.

*Creole Water.*—Orris root, 6¾ oz., cut in small pieces, and put in 1½ pt. of French brandy. Allow it to stand for 2 weeks, stir frequently, filter. Then add 3 pt. of French brandy, 3 dr. of oil of orange blossoms, ¾ fl.oz. of oil of geranium. Distill, and add a little coumarin essence.

*Florida Water.*—1.—Oil of bergamot, 2 oz.; fine oil of lavender, 1 oz.; oil of cloves, ¼ oz.; extract of civet, 1 oz.; oil of pimento, ¼ oz.; alcohol, 2 gal.; water, 4 pt.

2.—Oil of lavender, 4 oz.; oil of bergamot, 4 oz.; oil of cinnamon, 2 dr.; oil of cloves, 1 dr.; oil of neroli, 2 dr.; pure musk, 4 gr.; cologne spirits, 95%, 1 gal. Macerate 15 days, and filter through paper.

3.—Oil of bergamot, 3 fl.oz.; oil of lavender, 1 fl.oz.; oil of cloves, 1½ fl.dr.; best oil of cinnamon, 2½ fl.dr.; oil of neroli, ½ fl.dr.; oil of lemon, 1 fl.oz.; extract of jasmine, 6 fl.oz.; extract of musk, 2 fl.oz.; rose water, 1 pt.; deodorized alcohol, 8 pt.; magnesium carbonate, q. s. Mix, and if cloudy, filter through magnesium carbonate.

*Geranium Water.*—Oil of rose geranium, 2 oz.; tincture of orris root, 2 oz.; tincture of musk, 1 dr.; rose water, 8 oz.; alcohol, 4 pt.

*Goulard Water, Goulard's Lotion.*—This is ordered to be prepared by adding 2 fl.dr. of solution of diacetate of lead and 2 fl.dr. of rectified spirit to 10½

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fl.oz. of distilled water. It is kept ready prepared in the shops. It is white, and poisonous. Used as a sedative, refrigerant and astringent lotion, in various affections; also in many cosmetic washes.

**Heliotrope Water.**—Heliotropine, 2 dr.; rose oil, 15 minims; bergamot oil,  $\frac{1}{2}$  dr.; neroli oil, 5 minims; alcohol, 10 oz.; water, 6 oz.

**Honey Water.**—Oil of bergamot, 12 drops; oil of lemon, 12 drops; oil of neroli, 5 drops; rose water, 10 oz.; alcohol, 22 oz. Dissolve the oils in the alcohol, and add the rose water.

**Hungary Water, Compound Spirit of Rosemary.**—Rosemary tops, in blossom, 2 lb.; fresh sage,  $\frac{1}{4}$  lb.; rectified spirit, 3 qt.; water, 1 qt. Digest for 10 days, throw the whole into a still, add of common salt  $1\frac{1}{2}$  lb., and draw over 6 pt. To the distillate add of Jamaica ginger, bruised, 1 oz. Digest a few days, and either decant or filter. The old plan of adding the ginger before distillation is wrong, as the aromatic principle of the root does not pass over with the vapor of the alcohol.

**Lavender Water (Eau de Lavande).**—1.—Dissolve 3 kgm. of 90% spirit in 130 grams of lavender oil, and add 200 grams of rose water.

2.—Alcohol, 90%, 5 kgm.; lavender oil, 85 grams; lemon oil, 10 grams; geranium oil, African, 5 grams; Peru balsam, 32 grams; musk tincture, 50 grams; civet tincture, 25 grams; liquid storax, 50 grams.

3.—Flowering tops of lavender, fresh, and carefully picked, 10 lb.; rectified spirit, 1 gal.; water,  $\frac{1}{2}$  gal. Digest a week, throw it into a clean still, add  $1\frac{1}{2}$  lb. of common salt, dissolved in  $\frac{1}{2}$  gal. of water, and after stirring the whole together, draw over, rapidly, 1 gal., by the heat of steam or of a salt-water bath. To the distillate add oil of bergamot, 5 fl.dr.; essence of ambergris, finest, 2 fl.dr., and mix well.

4.—Finest oil of lavender, Mitcham, 2 oz.; finest essence of musk, 1 fl.oz.; finest essence of ambergris,  $\frac{1}{2}$  oz.; pure oil of bergamot, recent,  $\frac{1}{2}$  oz.; rectified alcohol (56 overproof, scentless),  $\frac{1}{2}$  gal. Mix by agitation. Very fine without distillation, but better for it, in which case the essences should be added to the distillate. Delightfully and powerfully fragrant.

5.—Smith's British Lavender.—Oil of lavender, Mitcham,  $\frac{1}{2}$  oz.; essence of ambergris,  $\frac{1}{4}$  oz.; eau de cologne, finest,  $\frac{1}{4}$  pt.; rectified alcohol,  $\frac{1}{2}$  pt. Mix by agitation. Very fragrant, and much esteemed. Eau de lavande is a most agree-

### (Toilet Waters)

able and fashionable perfume for personal use, but, like most others of its class, it must not be used too freely. Its excessive use distinguishes the vulgar.

6.—Eau de Lavande de Millefleurs.—Eau de lavande, 1 qt.; oil of cloves,  $1\frac{1}{2}$  fl.dr.; oil of cassia,  $\frac{1}{2}$  fl.dr.; essence of ambergris,  $\frac{1}{2}$  fl.dr. Mix.

**Lilac Water.**—1.—Lilac perfumes were formerly made by blending together the pomade washings of orange flowers and tuberose with otto of rose, the tuberose scent predominating. The more modern method is to make a solution of terpineol in deodorized alcohol, and to round off the odor with a little tuberose and rose extract. Terpineol, also called lilacine, is a thick liquid with a strong smell of lilac flowers. It is one of the new synthetic bodies now so largely used by perfumers. The following formula will be found to yield an agreeable toilet water: Terpineol, 1 oz.; oil of rose, 30 drops; tincture of benzoin, 30 drops; deodorized alcohol,  $7\frac{1}{2}$  pt.; orange-flower water, 8 oz.

2.—A cheaper toilet water is made by reducing the amount of terpineol and substituting distilled water for the orange-flower water. Use, say,  $\frac{1}{2}$  oz. of terpineol, dissolved in  $\frac{1}{2}$  gal. of deodorized alcohol, and add, by degrees, 8 pt. of distilled water, or as much as will be taken up without throwing the terpineol out of solution.

3.—Heliotropine,  $\frac{1}{2}$  oz.; ol. cananga, 2 dr.; ol. muguet, 2 dr.; anisic aldehyde, 2 dr.; ol. neroli and ol. jasmin, of each 2 dr.; rose water, 3 pt.; alcohol, 5 pt. Mix the perfumes with the alcohol, dissolve, add rose water, shake well, let set 3 days, and filter through tale.

4.—Essence of tuberose, 4 oz.; essence of orange flowers, 1 oz.; oil of bitter almond, 1 drop; alcohol, 1 qt.; tincture of civet, 1 dr.; water, a sufficient quantity. Add the essences, oil and tincture to the alcohol, then add the water gradually, with agitation, until the liquid becomes very slightly milky, and filter.

**Myrtle Water, Eau de Myrthe.**—Alcohol, 3 l.; myrtle water, 1 l.; balm water, 0.5 l.; myrtle oil, 300 grams; orange-flower water, 450 grams; rose water, 500 grams.

**Orange-Flower Waters.**—1.—Orange-flower essence, 8 oz.; magnesium carbonate, 1 oz.; water, 8 pt. Triturate the essence with the magnesium carbonate, gradually adding the water, and filter.

2.—Oil of neroli, 90 minims; magnesium carbonate, 1 dr.; water, 8 pt. Proceed as in No. 1.

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**Orgeat Rum (Bay Rum Substitute).—**Essential oil of almonds, 32 drops; extract of vanilla, 1 fl.oz.; alcohol, 12 fl.oz.; water, sufficient to make 2 pt.; tincture of cudbear, enough to color. Dissolve the oil in the alcohol, add the extract of vanilla, water and tincture of cudbear. Shake well. If not perfectly clear, rub with a little carbonate of magnesia, and filter through paper. As a rule, it does not require filtration.

**Pond-Lily Extract.**—Essence of tuberose, 1 oz.; essence of jasmine, 1 dr.; essence of orange flowers, 2 dr.; essence of cassia, 4 dr.; spirit of rose, 4 dr.; spirit of almond, 15 minims; tincture of vanilla, 3 dr. The essences are made by washing their respective pomades with deodorized alcohol, 1 pt. to the lb., in the usual way. The spirit of rose consists of 80 minims each of oil of rose and oil of rose geranium in 1 pt. of deodorized alcohol, while the spirit of almond is made by dissolving 80 minims of oil of bitter almond in 1 pt. of the spirit. By diluting the extract with orange-flower water and deodorized alcohol, much or little, according to the price at which the finished product is to be sold, a pond-lily toilet water results.

**Rose Water.**—A rose water made from the oil, with a trace of oil of clove, has been found to resemble the distilled water very closely, and possesses a "remarkably true rose odor." A rose spirit for the preparation of rose water is as follows: Rose oil, 2.5 grams; clove oil, 0.25 gram; alcohol, to make 100 c.c.; 10 c.c. of this spirit, mixed with 1,000 c.c. of boiling distilled water, and allowed to stand until it has undergone the viscous fermentation and blend, produces "a product eminently superior to the commercial water." If, after ageing, the water becomes turbid, it can be clarified by the addition of a little calcium phosphate or kaolin before filtration.

**Verbena Water.**—Extract of verbena, 4 oz.; cologne spirit, 8 oz.

**Violet Water.**—Violet extracts and waters may be divided into two classes, those made with ionone and those which depend upon a combination of rose, bergamot and sandalwood for a vague suggestion of violet. The only point of agreement is in the use of sandalwood and musk. Sandalwood is prominent in most of the violet perfumes, and some contain quantities of musk (artificial or natural) far above what is commonly employed in perfumes. Plainly, "violet" is not adapted as a refreshing toilet accessory for persons not in vigorous health. The combinations

### (Toilet Waters)

containing ionone may have a suggestion of the real violet odor. Ionone itself has a delicate odor, and a quality which can only be described as "thin," and it resembles the odor of violets only in part. It needs something to fill it out and give it "body," to become acceptable as a perfume. The most convenient single agent for this purpose is sandalwood, and the more of this the perfume contains the more certain is the user that "something smells." Ionone, though thin, is very extensible. Doubling the quantity does not double its apparent power. The art of its use lies in properly developing and backing it in a mixture. So almost any of the heavier and more prominent odors can be, and probably are, used in its combinations. Violet, more than any other odor, needs time to develop. Ionone disappears entirely when first added to alcohol, but after a few days it begins to show its presence, and it continues to develop for some time. Most of the published formulas direct excessive quantities of ionone, and the result may be unsatisfactory, while the cost is prohibitive. Oil of orris may be used in place of ionone, using about eight times as much.

1.—Violet pomade, 6 lb.; rectified spirit, 1 gal. Macerate and digest, in closed vessel, for a month, and decant. Then add 3 oz. of tincture of orris root and 3 oz. of cassia spirit to each pint.

2.—Ionone, 2 dr.; oil of sandalwood, 4 dr.; oil of neroli, 1 dr.; oil of bitter almond, 8 minims; oil of spearmint, 15 minims; heliotropine, 1 dr.; musk (artificial preferred), 2 gr.; tincture of civet, 4 dr.; water, 2 pt.; alcohol, 6 pt.

3.—In some of the popular "violets," the rose odor is very prominent, and combinations with rose are almost as common as ionone mixtures. In the cheaper grades, rose geranium is used in place of rose, and the following is typical of this class, but the rose odor does not predominate: Oil of sandalwood, 4 dr.; oil of bergamot, 4 dr.; oil of rose geranium (Algerian), 2 dr.; oil of neroli, 1 dr.; oil of bitter almond, 15 minims; musk (artificial or natural), 1 gr.; tincture of benzoin, 4 dr.; powdered orris root, 2 oz.; water, 3 pt.; alcohol, 5 pt. Macerate 30 days, and filter. The samples are colored with just a trace of green dye, not enough to leave a stain. This mixture needs a number of weeks to blend. Oil of rose, in smaller quantity, in place of oil of geranium, will make a softer and more fragrant water.

4.—Spirit of ionone, 10%, ½ dr.; distilled water, 5 oz.; orange-flower water,



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1 oz.; rose water, 1 oz.; cologne spirit, 8 oz. Add the spirit of ionone to the alcohol, and then add the waters. Let stand, and filter.

5.—Violet extract, 2 oz.; cassie extract, 1 oz.; spirit of rose,  $\frac{1}{2}$  oz.; tincture of orris,  $\frac{1}{2}$  oz.; green coloring, a sufficiency; alcohol, to 20 oz.

6.—Tincture of orris, 64 oz.; tincture of vanillin, 16 oz.; oil of sandalwood,  $\frac{1}{2}$  oz.; oil of bergamot, 1 oz.; oil of rose geranium,  $\frac{1}{2}$  oz.; cologne spirit, 80 oz.; rose water, 96 oz. Dissolve the oils in the spirit; add the tinctures, and set aside for 3 days; then add the water slowly, stirring well, and let stand for 2 weeks before filtering. Color with chlorophyll or aniline green to the tint required.

### Vinegars.

These are solutions of aromatics in acetic acid, and are highly esteemed as reviving perfumes, both for the toilet and sick-room. They are corrosive, and should, therefore, be kept from contact with the skin and clothes. For use, they should be dropped on a piece of sponge, and placed in a stoppered bottle or vinaigrette. This refers to toilet vinegars.

*Aromatic Vinegar.*—1.—Henry's.—Dried leaves of rosemary, rue, wormwood, sage, mint and lavender flowers, of each  $\frac{1}{2}$  oz.; bruised nutmeg, cloves, angelica root and camphor, of each  $\frac{1}{4}$  oz.; rectified alcohol, 4 oz.; concentrated acetic acid, 16 oz. Macerate the materials for a day in the spirit, then add the acid, and digest for a week longer, at a temperature of 14 or 15° C. Finally, press out the now aromatized acid, and filter it.

2.—Concentrated acetic acid, 8 oz.; otto of English lavender, 2 dr.; otto of English rosemary, 1 dr.; otto of cloves, 1 dr.; otto of camphor, 1 oz. First dissolve the bruised camphor in the acetic acid, then add the perfumery; after remaining together for a few days, with occasional agitation, filter. All vinegars are used by pouring 3 or 4 dr. into an ornamental smelling bottle, previously filled with crystals of sulphate of potash.

3.—Aromatic Vinegar, *Aromatic Acetic Acid*, *Vinaigre Aromatique*, *Acide Acétique Aromatique*, *Acetum Aromaticum*, *Acidum A. A.*—The following are approved formulas: Glacial acetic acid, 1 lb.; 90% alcohol, 2 fl. oz.; pure camphor, crushed small,  $2\frac{1}{2}$  oz.; finest oil of cloves,  $1\frac{1}{2}$  dr.; oil of rosemary, 1 dr.; oil of bergamot,  $\frac{1}{2}$  dr.; oil of cinnamon,  $\frac{1}{2}$  dr.; oil of lavender,  $\frac{1}{2}$  dr.; oil of pimento,  $\frac{1}{2}$  dr.; neroli, or essence of de petit grain,  $\frac{1}{2}$  dr. Mix in a stoppered bottle, and

### (Toilet Vinegars)

agitate until the whole of the camphor is dissolved. Very fine, and highly esteemed.

4.—Essence of bergamot, 10 minims; essence of musk, 15 minims; essence of neroli, 10 minims; essence of tonka,  $\frac{1}{2}$  dr.; otto of rose, 5 minims; glacial acetic acid, 1 dr.; alcohol, 3 oz.

5.—Vinaigre de Cologne.—To eau de cologne, 1 pt., add strong acetic acid,  $\frac{1}{2}$  oz.

6.—Cosmetic Vinegar, *Piesse & Lubin's*.—Spirit, 1 qt.; gum benzoin, 3 oz.; concentrated aromatic vinegar, 1 oz.; balsam of Peru, 1 oz.; otto of neroli, 1 dr.; otto of nutmeg,  $\frac{1}{2}$  dr. This is one of the best made.

7.—Elder-Flower Vinegar.—To every  $\frac{1}{2}$  peck of the flowers, free from stalks, put 1 gal. of strong ale vinegar; set in the sun, in a stone jar, for a fortnight, then filter through a flannel bag; bottle off into quite small bottles.

8.—Health Vinegar (*Vinaigre anti-Méphitique*).—To 7 qt. of water take alcohol,  $4\frac{1}{2}$  qt.; essence of bergamot, 1 oz.; essence of lemon, 1 oz.; essence of Portugal, 3 dr.; essence of rosemary, 6 dr.; essence of lavender, 2 dr.; essence of neroli, 1 dr.; tincture of mélisse, 1 pt. Mix the whole together, and after 24 hours' repose add infusion of storax, 2 oz.; infusion of benzoin, 2 oz.; infusion of cloves, 2 oz. Shake well again, then pour in 2 qt. of good vinegar, and after some hours filter, and mix 3 oz. of strong acetic acid.

9.—Hygienic Vinegar.—Brandy, 1 pt.; otto of cloves, 1 dr.; otto of lavender, 1 dr.; otto of marjoram,  $\frac{1}{2}$  dr.; gum benzoin, 1 oz. Macerate these together for a few hours, then add brown vinegar, 2 pt.; and strain or filter, if required to be bright.

10.—Marseilles Vinegar.—Four Thieves Vinegar, Prophylactic Vinegar, *Vinaigre des Quatre Voleurs*, *Acetum Quator Furum*.—The original formula for this once celebrated preparation is: Dried rosemary tops, 4 oz.; dried sage flowers, 4 oz.; dried lavender flowers, 2 oz.; fresh rue,  $1\frac{1}{2}$  oz.; camphor, dissolved in spirit, 1 oz.; sliced garlic,  $\frac{1}{4}$  oz.; bruised cloves, 1 dr.; strongest distilled wine vinegar, 1 gal. Digest for 7 or 8 days, with occasional agitation; pour off the liquor, press out the remainder, and filter the mixed liquids. It is said that this medicated vinegar was invented by four thieves of Marseilles, who successfully employed it as a prophylactic during a visitation of pestilence.

11.—Medicated Vinegar Essence.—a.—

## Toilet Preparations—Perfumes

### (Perspiration)

Herb. Dracuculi rec., 200; Fruct. Anethi rec., 200; Herb. Achilleae moschat, 25; Fol. Lauri, 25. These spices are well moistened with diluted alcohol, and after 24 hours 5,000 parts of acetic acid (80%) are poured over it. After 5 days it is squeezed off and filtered. This aroma is then mixed with 80% of acetic acid, as required.

b.—4 parts by weight of tarragon oil, 8 parts oil of celery, 4 parts pepperwort oil, 5 parts oil of parsley, and 30 parts Maitrank essence; add alcohol to make up 1,000 parts. One part of this mixture is added to 1,000 parts of the acid. As a coloring agent for vinegar essences, a solution of sugar color in acetic acid, or for hotels (which frequently prefer red colored table vinegar), a solution of cochineal red in concentrated acetic acid is employed.

12.—Rose Toilet Vinegar.—a.—Dry rose leaves, 112 parts; triple rose extract, 280 parts; acetic acid, 140 parts; distilled water, 980 parts. Mix. Let macerate for 14 days, then filter.

b.—Concentrated acetic acid, 1 oz.; otto of roses,  $\frac{1}{2}$  dr. Well shaken together.

### Perspiration.

1.—*Facial Preparation*.—Lavender water, 50 grams; lemon water, 50 grams; peppermint water, 50 grams; tincture of myrrh, 50 grams; tincture of quallaya, 50 grams; sodium carbonate, 20 grams. Three times daily moisten a portion of a napkin, dipped in water and wrung out, with the above mixture, from a dropping bottle, and wash the face with it.

2.—*Hands*.—a.—Zinc oleate, 10 parts; bismuth subnitrate, 20 parts; beta-naphthol, 1 part; starch, 69 parts.

b.—Zinc oleate, 1 dr.; bismuth subnitrate, 2 dr.; betanaphthol, 10 gr. Dust frequently over the surface.

3.—*Hands and Feet*.—Prepared Venetian talc, 20 oz.; powdered orris root, 10 oz.; oxide of zinc, 5 oz.; powdered tartaric acid, 5 oz.; powdered boric acid, 5 oz.; salicylic acid,  $2\frac{1}{2}$  oz.; menthol,  $\frac{1}{4}$  oz.; oil of eucalyptus,  $\frac{1}{4}$  oz. Make a fine powder, to be applied to the hands and feet, or to be sprinkled inside the gloves or stockings.

4.—*Odorous Perspiration*.—a.—Zinc oleate, 4 dr.; boric acid, 3 dr. Keep the surface constantly covered with the powder.

b.—Hydrastine hydrochloride, 5 gr.; cologne water, 4 oz. Apply frequently to the surface.

### (Pomades)

c.—Zinc oleate,  $\frac{1}{2}$  oz.; powdered starch, 1 oz.; salicylic acid, 20 gr.

### Pomades.

1.—*Base*.—a.—Lard, 725 grams; white wax, 75 grams; borax, 10 grams; water, 200 grams. Fuse the lard and wax together, allow it to cool, and when nearly congealing stir it briskly until quite stiff; dissolve the borax in the water, and add it gradually to the above, with constant stirring, until thoroughly incorporated.

b.—Lard, 100 grams; coconut oil, 400 grams; white wax, 100 grams; borax, 10 grams; water, 400 grams. Prepared as above.

2.—*Cacao Pomade*.—Cacao butter,  $1\frac{1}{2}$  oz.; yellow wax,  $1\frac{1}{2}$  oz.; olive oil, 5 oz.; oil of lemon grass,  $\frac{1}{4}$  oz.; oil of rose, 6 drops; oil of neroli, 6 drops.

3.—*Cucumber Pomade*.—a.—White wax, 3 dr.; spermaceti, 3 dr.; oil of almond, 7 oz.; fresh cucumber juice, 7 oz.; extract of cucumber, 1 oz.

b.—Veal suet, 600 parts; lard, 1,000 parts; cucumber juice, 1,200 parts; tincture of tolu, 2 parts; rose water, 10 parts. To the liquefied suet and lard add the tolu tincture; when nearly cool, gradually incorporate the cucumber juice and rose water, previously mixed, stirring constantly.

4.—*Liquid Pomade*.—White wax, 30 parts; olive oil, 450 parts; fused together and perfumed with 25 parts of oil of bergamot, 15 parts of oil of clove and 5 parts of oil of lavender.

5.—*Stick Pomade*.—a.—White.—Melt together, white wax, 50 parts; castor oil, 25 parts; Venetian turpentine, 25 parts. For every 3 oz. of the mixture add 5 drops of the perfume given below.

b.—Blonde.—Melt together, yellow wax, 250 parts; castor oil, 125 parts; Venetian turpentine, 125 parts; ethereal extract of annatto, 1 part; and perfume as above.

c.—Light Brown.—Use the bases given above (for blonde), adding 1 part of extract of alkanet and  $2\frac{1}{2}$  parts of chlorophyll. Perfume as above.

d.—Dark Brown.—The same bases as for light brown, the deepening of the shade being obtained by increasing the proportion of extract of alkanet and chlorophyll, a very dark brown being secured by doubling the proportion of these ingredients. An intense brown is obtained by the addition of amber, which should be rubbed up with the castor oil before melting.

e.—Perfume for Stick Pomades.—Bergamot oil, 400 parts; lemon oil, 300 parts; oil of lavender, 200 parts; neroli oil, 50

## Toilet Preparations

### (Powders)

parts; cinnamon oil, 30 parts; clove oil, 20 parts; oil of wintergreen, 10 parts; attar of ylang-ylang, 5 parts; heliotropine, 5 parts; coumarin, 1 part. Mix, and let stand for several days before using. Five drops to every 3 oz. of pomade are sufficient.

6.—*Walnut Pomade*.—Green walnut shells, 1 lb.; powdered alum, 2 oz.; olive oil, 24 oz.; palm oil, 4 oz.; white wax, 3 oz. Bruise, digest together on a sand bath until the moisture has evaporated, strain, and when nearly cold add rose pomade, 6 oz.; jasmine pomade, 3 oz.; orange pomade, 2 oz.; previously melted on a water bath. Collect the walnut shells before they get too ripe and dry.

### Powders.

*Barber's Powder*.—1.—Corn starch, 5 lb.; precipitated chalk, 3 lb.; powdered talc, 2 lb.; oil of neroli, 1 dr.; oil of citron, 1 dr.; oil of orange, 2 dr.; extract of jasmine, 1 oz.

2. *Styptic Powder*.—The majority of the preparations upon the market contain tannic acid, alum, subsulphate of iron, or some other astringent substance, which, when applied, will arrest local bleeding. Two formulas follow:

a.—Alum, nutgalls, gum arabic, gum benzoin, of each, equal parts. Powder each separately, and mix.

b.—Alum, gum tragacanth, tannic acid, of each, equal parts. Powder, and mix.

*Face Powder*.—1.—Rose.—White talcum, 8 lb.; fine kaolin, 4 lb. Mix.

2.—Magnesium carbonate, 60 parts; zinc oxide, 350 parts; talcum, 590 parts; perfume to suit.

3.—Pink powder is produced by triturating the above with an ammoniacal carmine solution, and the yellow tint by adding to 985 parts of white powder  $\frac{1}{2}$  part of carmine and 15 parts of yellow ochre.

4.—An authority says a good face powder must contain snow-white stearite, light calcium carbonate, zinc white and wheat or rice starch. Flesh color for blonds is produced by carmine, and the tint for brunettes by burnt umber or sienna. Orris is best for scent. The following ideal cosmetic powder is constructed from these ingredients: Zinc white, 500 parts; English precipitated calcium carbonate, 3,000 parts; best white stearite, 500 parts; wheat or rich starch, 1,000 parts; triple extract of white rose, 30 parts; triple extract of jasmine, 30 parts; triple extract of orange flower, 30 parts; extract of cassia, 30 parts; tincture of musk, 8 parts. Mix thoroughly by re-

### (Powders)

peated siftings. Orris root, in powder, may be substituted for the perfumes.

5.—Magnesium carbonate,  $\frac{1}{2}$  lb.; powdered talc, 1 lb.; oil of rose, 8 drops; oil of neroli, 20 drops; extract of jasmine,  $\frac{1}{2}$  oz.; extract of musk, 1 dr.

6.—Corn starch, 7 lb.; rice flour, 1 lb.; powdered talc, 1 lb.; powdered orris, 1 lb.; extract of cassia, 3 oz.; extract of jasmine, 1 oz. Mix thoroughly, and pass through a 100-mesh bolting cloth.

7.—Zinc oxide, 4 oz.; rice powder, 14 oz.; precipitated chalk, 4 oz.; talcum powder, 2 oz.; orris root, powder, 2 oz.; perfume, sufficient.

8.—Zinc oxide, 2 oz.; orris root, powder, 2 oz.; rice flour, 16 oz.; oil of rose, 9 drops; oil of rose geranium, 3 drops; oil of ylang-ylang, 1 drop; coumarin,  $\frac{1}{2}$  gr.; acetic ether, 10 drops. Mix the first three ingredients; mix the other ingredients so as to dissolve the coumarin, and incorporate this mixture with the powder.

9.—Venetian chalk, 20 lb.; subnitrate of bismuth, 42 oz.; zinc white, 42 oz.; oil of lemon,  $1\frac{1}{2}$  oz.

10.—Talc, 10 dr.; orris root, 1 dr.; oil of bergamot, 1 drop.

11.—Bismuth subnitrate,  $\frac{1}{2}$  dr.; purified talcum,  $1\frac{1}{2}$  oz.; wheat starch, 2 oz.; gypsum, 3 oz.; triple extract of fleur de lis, 1 dr. Mix intimately, and pass through fine bolting cloth.

12.—Talc, of the finest white grade, 38 lb.; English precipitated chalk, 25 lb.; powdered carbonate of magnesium, 10 lb.; oxychloride of bismuth, 7 lb.; corn starch, 20 lb.; acid salicylic, true, 43 gr.; pure oil of rose, 5 dr.; heliotropine,  $\frac{1}{2}$  oz.; oil of bitter almonds, 10 drops. Triturate oils, heliotrope, salicylic acid with bismuth, thoroughly; mix with balance, and sift through bolting cloth.

13.—Venice talc, very finely ground, 50 parts; rice flour, 50 parts; zinc oxide (or oxychloride), 25 parts; oil of bergamot, 3 parts; attar of ylang-ylang, 2 parts; neroli oil, 2 parts. Mix, and pass through bolting cloth twice.

14.—Blonde.—"White" powder,  $1\frac{1}{2}$  lb.; carmine, No. 40, 5 gr.; burnt umber, in fine powder, 2 dr.; raw sienna, 2 dr. Proceed as with the "pink."

15.—Brunette or Rachele.—Base, 9 lb.; powdered Florentine orris, 1 lb.; perfume the same; powdered yellow ochre, 3 oz. 120 gr. (av.); carmine No. 40, 60 gr. Rub down the carmine and ochre with alcohol, in a mortar, and spread on glass to dry; then mix and sift.

16.—Flesh Face Powder.—Base, 9 lb.; powdered Florentine orris, 1 lb.; carmine

## Toilet Preparations

### (Powders)

No. 40, 250 gr.; extract of jasmine, 100 minims; oil of neroli, 20 minims; vanillin, 5 gr.; artificial musk, 30 gr.; white heliotropine, 30 gr.; coumarin, 1 gr. Rub the carmine with a portion of the base and alcohol, in a mortar, mixing the perfume the same way in another large mortar, and adding the orris. Mix, and sift all until specks of carmine disappear on rubbing.

17.—Grecian Face Powder.—Zinc oxide, 7 oz.; powdered talcum, 9 oz.; precipitated chalk, 1 oz.; magnesium carbonate, 1 oz.; extract of jasmine, 30 drops; extract of white rose, 15 drops. Mix well, and run through fine sieve.

18.—Lanolin Face Powder.—Lanolin, anhydrous, 1 oz.; starch, 1 oz.; talcum powder, 20 oz.; coumarin, 24 gr.; oil of rose, 16 gtt. The lanolin and the perfume are gradually mixed; the talcum, and then the starch is added. Lanolin may also be incorporated in face powders by dissolving in some volatile solvent, like ether, chloroform or benzine, incorporating this solution quickly with magnesia, chalk, or other powder, allowing the solvent to vaporize, and incorporating other suitable ingredients with the residue. Lanolin is introduced into some face powders owing to the dryness of the skin, or to prevent the latter from becoming dry and scaly. The fat imparts to the powder a desirable smoothness, increases the power to adhere to the skin, and preserves the latter in a smooth and supple condition.

19.—Rose Face Powder.—Starch, 3,150 grams; rose oil, 2 grams; essential bergamot oil, 20 drops; attar of roses, 10 drops; rose geranium oil, 60 drops. Mix well, and sift.

20.—White Face Powder.—Base, 9 lb.; powdered Florentine orris, 1 lb. Perfume the same. Mix and sift.

*Foot Powder.*—1.—Formoform Dusting Powder.—A white powder, having a feeble odor of thymol. It has the following composition: Formaldehyde, 0.13%; thymol, 0.1%; zinc oxide, 34.44%; starch, 65.27%. Intended as a disinfectant for perspiring feet. It is said to have great disinfecting power, in consequence of splitting off formaldehyde, when brought in contact with wounds and pus formations.

2.—An unfailing remedy for sweaty feet and bad odor of the feet. Powdered alum, 21 parts; maize meal, 1 part.

*Glove Powder.*—1.—Castile soap, dried by exposure to a warm, dry atmosphere for a few days, and then reduced to fine powder in a mortar. Used to clean gloves.

### (Powders)

2.—Pipeclay, colored with yellow ochre, amber or Irish slate, q. s., and afterward scented with a little powdered orris root or cloves. Used to color gloves made of doeskin, and similar leather.

*Infant Powders.*—1.—Calcined magnesia, 50 parts; Venetian talc, 250 parts; boracic acid, 1 part.

2.—Arrow root, 1 lb.; orris root, 2½ oz.

3.—Potato or wheat starch, 1 lb.; orris root, ¾ oz.; oil of bergamot, 10 drops; oil of rhodium, 2 drops. Boracic acid may, if desired, be added to this powder, the amount given in No. 1 serving as a guide.

4.—Salicylic acid, 2 parts; talcum, 100 parts; lycopodium, 100 parts; starch, in finest powder, 50 parts; zinc oxide, c. p., 20 parts. Mix intimately by sieving several times. This powder not only is very grateful to the tender skin, but it rapidly heals chafes and other similar injuries.

5.—Fuller's earth, 9 oz.; boric acid, 1½ oz.; zinc oxide, 3 oz.; starch, 9 oz.; orris root, 1½ oz.; oil of bergamot, 2 dr. Mix the powders thoroughly, then add the oil, and pass through a fine sieve.

6.—Lycopodium Powder.—An absorbent for excoriated surfaces in infants. Lycopodium, ½ lb.; rose or violet toilet powder, 1 lb.

7.—Magnesium Powder.—Chlorate of potash, 3 parts; perchlorate of potash, 3 parts; magnesium powder, 4 parts.

8.—Meen Fun (Chinese Skin Powder).—Magnesian earth. Very absorbent.

9.—Violet Powder.—Calcined magnesia, 50 parts; Venetian talc, 250 parts; boracic acid, 1 part. Scent with a small admixture of orris root, or any suitable mild essential oil.

*Infusorial Earth as a Dusting Powder.*—Infusorial earth, sterilized by being subjected to a heat sufficient to cause it to glow, constitutes, it is said, an excellent inert dusting powder. It is capable of absorbing about six times its own weight of water. Mixtures of equal parts of this earth, thus dried, with salicylic acid, salol, or iodoform, have proved of equal use.

*Meal Preparations.*—1.—Almond Powder for the Toilet.—a.—Almond meal, 6 kgm.; bran meal, 3 kgm.; soap powder, 0.6 kgm.; bergamot oil, 50 grams; lemon oil, 15 grams; clove oil, 15 grams; neroli oil, 6 grams.

b.—Oatmeal, almond meal, ground fine of each, equal parts; perfume, sufficiency. Mix, and pass through a coarse sieve.

c.—Wheat flour, 4 lb.; almond bran, 1 lb.; orris root, fine powder, 1 lb.; extract

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### (Powders)

of rose, 1 pt.; glycerine, 6 fl.oz. Form into a dough, which is thinned with water, and painted on the skin.

d.—Glycerine, 4 parts; borax, 5 parts; almonds, 100 parts; oil of almonds, essence of musk, oil of neroli, of each a sufficiency. The almonds are blanched, rubbed to a fine powder, mixed with the other ingredients, and passed through a sieve. The product is perfumed as desired.

2.—Oatmeal.—a.—Oatmeal and almond meal, equal parts; perfume at will. Mix, and pass through a coarse sieve.

b.—Powdered orris root, 1 oz.; oatmeal, in fine powder, 8 oz.; oil of neroli, 2 drops; oil of bergamot, 5 drops. Mix the perfumes with the orris root, in a mortar, and gradually add the oatmeal, stirring well until perfectly mixed. A little of this powder may be dusted on the skin after washing.

3.—Rice Powder.—Starch, 3 lb.; rice flour, 1 lb.; perfume, q. s. Mix thoroughly, and pass through a sieve. Make a mold, or use a package of Lubin's powder for the purpose. Now take sheets of stiff manilla paper, cut to the proper size, and fold them on the mold, pasting or sealing the sides and bottom, and folding the top so that it can be opened. Fill your cartons with the powder, fold the top, and seal it, and then wrap in any embossed or fancy paper.

*Talcum Toilet Powder.*—1.—Talc, to be used as a toilet powder, should be in a state of very fine division. Antiseptics are sometimes added in small proportions, but these are presumably of little or no value in the quantity allowable, and may prove irritating. For general use, at all events, the talcum alone is the best and the safest. As a perfume, rose oil may be employed, but, on account of its cost, rose geranium oil is probably more frequently used. A satisfactory proportion is  $\frac{1}{2}$  dr. of the oil to 1 lb. of the powder. In order that the perfume may be thoroughly disseminated throughout the powder, the oil should be triturated first with a small portion of it; this should then be further triturated with a larger portion, and if the quantity operated on be large the final mixing may be effected by sifting. Many odors besides that of rose would, of course, be suitable for a toilet powder. Ylang-ylang would doubtless prove very attractive, but a powder perfumed with that odor would be somewhat expensive.

2.—Antiseptic Talc.—Powdered talc, 1 lb.; boric acid, 2 oz.; salicylic acid,  $2\frac{1}{2}$  dr.; oil of eucalyptus,  $\frac{1}{2}$  dr.; oil of

### (Rouge)

thyme, white, 20 drops. For general use, purified talc alone is best, and should be in a very fine state of division.

3.—Borated Talc.—a.—Powdered talc, 1 lb.; powdered boric acid, 1 oz. Such a powder is useful in soothing and healing reddened or cracked skin.

b.—Powdered talc, 2 lb.; magnesium carbonate, 4 oz.; boric acid,  $1\frac{1}{2}$  oz.

4.—Carbolated Talc.—Powdered talc, 1 lb.; carbolic acid,  $\frac{1}{4}$  oz. An antiseptic powder is made by this formula, the uses of which are numerous.

5.—Favorite Talcum Powder.—Boric acid, 1 av.oz.; salicylic acid, 100 gr.; talcum (face powder),  $7\frac{1}{2}$  lb.; powdered orris,  $\frac{1}{2}$  oz.; extract of violet,  $\frac{1}{2}$  oz. Mix.

6.—Phenolated Talc.—Boric acid, 2 oz.; phenol, crystals, 1 dr.; powdered talc, 14 oz.

7.—Rose Talc.—Powdered talc, 5 lb.; oil of rose,  $\frac{1}{2}$  dr.; extract of jasmine, 4 oz.

8.—Salicylated Talc.—Powdered talc, 5 lb.; salicylic acid, 3 oz. This produces an article of recognized value in preventing and curing offensive perspiration.

9.—Tannated Talc.—Powdered talc, 5 lb.; tannic acid, 4 oz. This is indicated in excoriated and suppurating surfaces.

10.—Tea Rose Talc.—Powdered talc, 5 lb.; oil of rose, 50 drops; oil of wintergreen, 4 drops; extract of jasmine, 2 oz.

### Prickly Heat.

1.—Bismuth subnitrate, 1 oz.; zinc carbonate, 1 oz.

2.—Hydrarg. chlor. mit., 80 gr.; lycopodium, 1 oz. Use as a dusting powder.

### Rouge. (See also Theatrical Paints.)

*Liquid.*—Several different preparations are sold under this name, but the first of those following only strictly deserves it.

1.—Dissolve pure rouge (carthamine) in alcohol, and acidulate the solution with acetic acid. Very rich.

2.—A solution of carmine in liquor of ammonia, or in carbonate of potash water, to be diluted for use. Rich colored.

3.—The red liquid left from the preparation of carmine. Inferior to the preceding.

4.—Spanish Lady's Rouge.—This is properly rouge crepons; but cotton wool which has been repeatedly wetted with a strong ammoniacal solution of carmine, and dried, is usually sold for it. Used like rouge crepons.

5.—Eosin, 4 parts; distilled water, 80 parts; glycerine, 20 parts; eau de cologne, 300 parts; spirit (free from fusel oil),

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400 parts. Dissolve; allow to stand, and filter. According to desire, the proportions of eosin may be increased or diminished, or modified with aniline orange.

6.—Finest carmine, 20 parts; lead white, 30 parts; French chalk, 60 parts; tincture of benzoin, simple, 5 parts; eau de cologne, 50 parts; rose water, 250 parts. Mix.

7.—Carmine, 4 parts; strongest ammonia, 4 parts; rose water, 500 parts; essence of rose, 15 parts. This liquid is principally used to give the lips the beautiful cherry-red color which is so much admired.

### Shaving Preparations.

1.—*Creams*.—As raw materials in the production of this class of toilet articles, lard, olive or sesame oil, and Cochin coconut oil are used. Before proceeding with the manufacture one must be sure that the fats and oils are perfectly fresh and clean. If this is not the case, they must undergo a process of refining. This consists in carefully boiling the substance in clean kettles, together with water, to which some cooking salt has been added. The fats thus purified are strained, and are ready for immediate use.

a.—Lard, 10 parts; olive or sesame oil, 8 parts; Cochin cocoa oil, 7 parts. Stir together at a temperature of 35° C. (95° F.), and add, in a thin stream, 12.5 parts of caustic potash lye of 40° B., and 1.5 parts of a potash solution of 150° B., with constant stirring. Maintain the agitation until the mixture saponifies and becomes thick and tenacious. As a perfume, use for every 25 kgm. of fats the following: Lavender oil, 100 grams; lemon oil, 50 grams; spike oil, 50 grams; thyme oil, 50 grams. These oils are stirred in at the last. For containers, use little porcelain jars. Keep in a cool place.

b.—Curd soap, 8 oz.; almond oil, 2 oz.; glycerine, 1 oz.; spermaceti, ½ oz.; carbonate of potassium, ¼ oz.; water, 16 oz. Cut the curd soap into shreds, and dissolve it by the aid of a water bath, in 14 oz. of water. Dissolve the spermaceti in the almond oil, and while warm mix it with glycerine, potash and remainder of the water; transfer to a warm mortar, gradually and steadily incorporate the warm soap solution, and continue to stir until a smooth paste is formed. With this incorporate a suitable perfume.

c.—Animal soap, 8 oz.; spermaceti, 2 oz.; rose water, 20 oz.; isinglass, 1 oz.; potassium carbonate, 1 dr.; whites of 4 eggs; lanolin, 1 oz.; perfume, enough. Heat the soap, spermaceti and the rose

### (Shaving Preparations)

water on a water bath until a jelly is formed; transfer to a warm mortar, and add the isinglass, first softened in a minimum of water, the potassium carbonate and the whites of the eggs. Mix well with an eggbeater; beat in the lanolin, and perfume as desired.

d.—Lard, 11 oz.; potassium hydroxide, 13 dr.; water, 4½ oz.; alcohol, 4 dr.; white of 1 egg; oil of bitter almond, 10 minims. Dissolve the potassium salt in the water, and triturate with the lard, in a mortar. Set aside for 12 hours, and add the oil, dissolved in the alcohol, and the white of the egg, beating the mass until it becomes pearly in appearance.

e.—Lard, 4 oz.; cocoanut oil, 12 oz.; Castile soap, dried and powdered, 2 oz.; solution of potassium hydroxide (sp. gr. 1.33), 8 oz.; oil of neroli, 5 minims; oil of rose geranium, 30 minims. Heat together the lard, the cocoanut oil and the potash lye for several hours, at 100° C. Sieve the powdered soap upon the mass, and incorporate it by continued trituration. When the mass has cooled, add the perfume, and transfer to collapsible tubes.

f.—Castile soap, 1 oz.; rose water, 4 fl.oz.; expressed oil of almond, 4 fl.dr.; oil of cacao, 4 fl.dr.; tincture of benzoin, 1 fl.dr.; oil of rose geranium, 5 minims; essential oil of almond, 5 minims; glycerine, sufficient. Digest the soap and water on a water bath. Melt the cacao in the expressed oil of almond at a gentle heat, and add to the soap and water; then incorporate the tincture of benzoin, and finally add the essential oils, and sufficient glycerine to produce a stiff cream.

g.—Collapsible Tubes.—The soaps known as shaving creams are usually, if not always, of the soft variety, and unless made too firm, can be put up in tubes as well as jars. Lard, 7 parts; caustic potassa, 1 part; water, 3 parts; glycerine, perfume, of each sufficient. Melt the lard in a porcelain vessel, over a salt-water bath; dissolve the potassa in the water, and run the lye formed, very slowly, into the melted grease, stirring thoroughly all the time, until saponification is completed. Then add the requisite perfume, and sufficient glycerine to render the mass thin enough to be adapted for use in tubes. The glycerine will aid in keeping the "cream" soft. For the perfume we would suggest the "brown Windsor" mixture given by Piesse, which consists of equal parts of the oils of caraway, clove, white thyme, cassia, orange leaf (petit grain) and lavender flowers. leaf (petit grain) and lavender flowers. Of

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### (Shaving Preparations)

this mixture about 2 dr. to the pound of cream would be required to give a fine odor. Of course, where expense is an object, cheaper oils and lesser quantities may be made to answer. The "cream," as ordinarily made, can be given a pearly appearance by trituration with a small proportion of alcohol. Whether the addition of glycerine will prevent the "pearling," we are unable to say.

b.—*Mentholated Cream*.—The mentholated cream frequently used by barbers as a cooling application to the face, after shaving, may be prepared, according to the *Pharmaceutical Era*, as follows: Put 1 oz. of tragacanth in 12 oz. of warm water, and allow to stand, with occasional agitation, for 2 or 3 days; then add 3 dr. of glycerine and 40 gr. of menthol, dissolved in  $\frac{1}{2}$  oz. of alcohol. Color pink with tincture of cudbear.

2.—*Liquid*.—a.—White soap, 10 lb.; alcohol, 20 lb.; orange-flower water, 30 lb. Melt up the soap with some of the orange-flower water, at as low a temperature as possible, and when complete solution has taken place add the rest of the orange-flower water and the alcohol. After the finished product has stood for a few hours in a closed vessel it is bottled. Some makers filter the solution, but if very pure materials are taken, and if the solution is allowed to stand and deposit any insoluble matter, as we have just recommended, the filtration, which is a long and tedious process, will become quite unnecessary.

b.—White soap, 12 lb.; essence of fat almonds,  $1\frac{1}{4}$  lb.; alcohol, 6 lb.; rose water, 6 lb.; tincture of amber, 2 oz.; tincture of benzoin, 2 oz. The manipulation is the same as that described above. The soap may be dyed pink with alkanet or cochineal tincture.

c.—To combine all the properties enumerated above, many makers who make a specialty of shaving soaps, prepare them at a boiling heat. The following recipe will, however, give good results at low temperatures, if the proportions given and the processes described are closely adhered to. Melt together 200 lb. of tallow and 50 lb. of cocoanut oil, and as soon as the mass is sufficiently liquid add 40 lb. of potash lye (30° B.) and 100 lb. of soda lye (30° B.). When the soap is thick enough to pour, scent with oil of kummel, 1 lb.; oil of lavender, 1 lb.; oil of thyme (white),  $\frac{1}{2}$  lb.; fennel oil,  $\frac{1}{4}$  lb.

d.—White soap, 1 lb.; alcohol, 2 pt.; orange-flower water, 3 pt. Melt the soap with some of the orange-flower water at as low a temperature as possible, and

### (Shaving Preparations)

when dissolved add the rest of the orange-flower water and the alcohol.

3.—*Lotions*.—a.—Spirit of lavender, 1 oz.; rose water, 6 oz.; distilled extract of witch hazel, to make 16 oz.

b.—Glycerine, 3 oz.; orange-flower water, 5 oz.; distilled extract of witch hazel, to make 16 oz. The perfume may be altered to suit the taste.

c.—Bay rum, 3 pt.; glycerine,  $\frac{1}{2}$  pt.; extract of violet,  $\frac{1}{2}$  oz.; rose water,  $\frac{1}{2}$  pt. Mix, and filter if necessary.

d.—Glycerine, 6 fl.oz.; quince seed,  $\frac{1}{2}$  dr.; alcohol, 5 fl.oz.; oil of rose, 16 minims; hot water, 21 fl.oz. Pour 8 fl.oz. of the water upon the quince seed, agitate well until a mucilage is formed, and strain through muslin. Pour the remainder of the hot water into a bottle, add the oil of rose, and shake well. Finally, add the alcohol. If desired, the preparation may be tinted by the use of a little aniline.

4.—*Paste*.—This popular cosmetic may be prepared in various ways, but the following formulas may be taken as representing the mode of manufacture:

a.—Naples soap, 1 lb.; Castile or Marseilles soap,  $\frac{1}{2}$  lb.; honey,  $\frac{1}{2}$  lb.; essence of ambergris, oils of cassia and nutmeg, of each 20 to 30 drops. Mix these ingredients well together in a mortar, adding a little rose water, until a perfectly homogeneous paste is formed.

b.—White or virgin wax, spermaceti and almond oil, of each 2 oz.; melt over a water bath, and then add 3 oz. of Windsor soap previously worked up into a paste with a little rose water. Mix all well together, and place in a jar, which should be kept well covered.

c.—White soft soap, 12 oz.; spermaceti and olive oil, of each  $1\frac{1}{2}$  oz. Melt these ingredients all together, and stir until the mass is nearly cold; perfume with any essential oil, or a mixture of perfumes, according to taste.

5.—*Powders*.—a.—To be used after shaving.—Corn starch, 5 lb.; precipitated chalk, 3 lb.; powdered talc, 2 lb.; oil of neroli, 1 dr.; oil of citron, 1 dr.; oil of orange, 2 dr.; extract of jasmine, 1 oz. Mix thoroughly, and pass through a 100-mesh bolting cloth.

b.—Powdered soap, 1.250 kgm.; sodium carbonate, 0.150 kgm.; wheat starch, 0.240 kgm.; orris root, 0.080 kgm.; oil of bergamot, 6 drops. Instead of the orris root the same weight of powdered quillaya and a very little oil of orris may be used. An addition of 19 to 20 grams of glycerine will render the powder milder in use.

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### (Shaving Preparations)

6.—*Soaps*.—The properties most essential to a good shaving soap are softness, economy in use, and the power of retaining a lather for the longest possible time.

a.—Purified tallow, 90 lb.; coconut oil, first quality, 10 lb.; soda lye, 80 lb.; potash lye, 20 lb.; color and scent to taste. Most shaving soaps contain coconut oil, as this fat is particularly efficacious in making them lather well.

b.—A very fine shaving soap solution may be made by taking  $\frac{1}{4}$  lb. of white Castile soap, in shavings, 1 pt. of rectified spirit,  $\frac{1}{4}$  pt. of water; perfume to taste. Put in a bottle, cork tightly, set in warm water for a short time, and agitate occasionally till solution is complete. Let stand, pour the liquid off the dregs, and bottle for use.

c.—Hampel's shaving soap is made by his patented process, as follows: Cleaned olein, 6.6%, is first mixed thoroughly with 13% of hot water; then 5.4% of soda lye at 25° is added, and the mass, which assumes the appearance of soft butter, is agitated until it becomes cold and is easily liquefied, when 12.5% of best white soap and 50% of boiling water are added. All these ingredients are to be well mixed together, and finally 12.5% of spirit at 90° is to be added, and well incorporated with the mass. The compound is then to be covered, and allowed to rest for a while, after which it is filtered, and is then ready for use.

d.—*Antiseptic Shaving Soap*.—(1) If you do not wish to make the soap direct from the ingredients, you can melt any good tallow soap, and to the molten mass add about 3% of salol, in powder, and incorporate it by vigorous stirring, which should be kept up until the mass commences to set in cooling. If you wish to make the article outright, proceed as follows: Melt together 400 parts of beef tallow and 200 parts of cacao butter. Let the mass cool down to about 125° or 130° F., then add 340 parts of soda lye of 30° B., and 60 parts of potash lye of the same density B. (sp. gr. 1.261). Now raise the temperature slightly, and stir vigorously for 30 minutes, or until the mass becomes homogeneous; add the salol, remove from the fire, and stir as before directed. If you desire to perfume the product, you can use formula given above, or any you may desire.

(2) The following makes a very pleasant mixture: Oil of kummel, 4 parts; oil of bergamot, 5 parts; oil of lavender, 3 parts; oil of thyme, 2 parts; oil of myrbane, 1 part. Mix. In adding the perfume to the soap it should be done gradu-

### (Shaving Preparations)

ally, little by little, and under constant stirring. Add about 1 dr. of the above mixture to 1 lb. avoirdupois of the soap.

(3) Hard paraffine (130° F., melting point), 22 parts; beef tallow, 3 parts; potash soap, 2 parts; boiling water, 68 parts. Put the paraffine, tallow and soap in a suitable vessel, on the water bath, raise to the melting point, then add the boiling water, under constant stirring, which should be maintained until a complete emulsion is obtained. Let cool down, still keeping up the agitation, to 100° F., then add, all at once, 2 parts of powdered tragacanth, 2 parts of glycerine and 1 part of oil of lavender, and stir until the mass sets.

(4) Take any good tallow soap, old, and well dried, and reduce it to a powder. To every 2 lb. of powder add the following: Coumarin, 1 drop; bergamot oil, 5 drops; balsamic oil mixture, 3 drops; oil of wintergreen, 2 drops. Mix thoroughly, and put up in appropriate glass or block-tin boxes. For "balsamic oil mixture," see National Formulary, or the dispensaries.

e.—*Depilatory Soap*.—(1) Powdered wheat starch, 20 parts; water, 120 parts. (2) Sodium sulphide, 34 parts; barium sulphide, 30 parts; water, 180 parts. (3) Palm oil, 36 parts; glycerine, 21 parts. Dissolve the powdered starch in 120 parts of tepid water, in one vessel, and set aside for use when wanted (1). In a second vessel dissolve the sodium sulphide (crystals), and stir it and the barium sulphide into the 180 parts of water (2). Add the glycerine. In another separate vessel melt the palm oil. To mix the compounds, make the sulphide solution (2) boiling hot, stir up the starch solution (1), and then gradually stir it into the sulphide solution (2); keep stirring until the starch thickens; add the melted palm oil, mix all well together, and add the perfume (citronella essence, mirbane, or oil of lavender, etc.). Before the mass cools and congeals, pour it into porcelain pots or wide-mouthed bottles. Rub the soap into the hair to be removed until the hair loses its crispness and filamentous form, and becomes a pulpy mass; then wash the part well with water, and the hair will all be removed. Should the skin smart after applying the soap, rub in a little olive oil or vaseline.

f.—*Eukesis, or Essence of Soap*.—Shaving cream, 9 oz.; liquor potassa, 3 dr.; sweet oil of almonds,  $\frac{3}{4}$  oz.; alcohol, 60°,  $1\frac{1}{2}$  pt.; oil of pimento,  $\frac{3}{4}$  dr.; oil of almond, essential,  $1\frac{1}{2}$  dr.; oil of bergamot, 3 dr.



## Toilet Preparations

### (Tattoo Marks)

#### Sponge Powder.

Dried sodium carbonate, 15 oz.; sodium sulphite, 1 oz.; oil of lavender, 10 minims; oil of verbenia, 2 min. Add 1 teaspoonful to 1 qt. of warm water. Soak, squeezing occasionally, for half an hour. Rinse well in clean water.

There are formulas for sponges under **CLEANSING**.

#### Sunburn Remedies.

1.—Zinc sulphocarbonate, 1 part; glycerine, 20 parts; rose water, 70 parts; 90% alcohol, 8 parts; cologne water, 1 part; spirit of camphor, 1 part.

2.—Borax, 4 parts; potassium chlorate, 2 parts; glycerine, 10 parts; alcohol, 4 parts; rose water, to make 90 parts.

3.—Citric acid, 2 dr.; ferrous sulphate (crystals), 18 gr.; camphor, 2 gr.; elder-flower water, 3 fl.oz.

4.—Potassium carbonate, 3 parts; sodium chloride, 2 parts; orange-flower water, 15 parts; rose water, 65 parts.

5.—Boroglycerine, 50%. 1 part; ointment of rose water, 9 parts.

6.—Sodium bicarbonate, 1 part; ointment of rose water, 7 parts.

#### Tattoo Marks.

1.—These are said to be removable by the application of a paste of salicylic acid and glycerine. A compress is applied over the paste, and the whole secured with sticking plaster. After about 8 days the paste is taken off, the dead skin removed, and the application of the paste repeated (as a rule, three times).

2.—Applications of cotton wadding, soaked in chloroform, and kept in place by means of a bandage, are also recommended.

3.—The following mixture is also reported to be efficacious: Pepsin, 5 parts; water, 25 parts; glycerine, 75 parts; dilute hydrochloric acid, 1 part. The pepsin is rubbed down in a mortar with the mixture of hydrochloric acid and water, the mixture allowed to stand for an hour, the glycerine added, the whole left standing for 3 hours, and then filtered.

4.—The operation is performed by applying nitric acid with the stopper of the bottle (a better instrument would be a glass rod, pointed, to carry the acid), just sufficient to cover the stain, so as to avoid making a larger scar than needful, the acid to remain about 1½ minutes, until the *cutis vera* is penetrated, and a crusted appearance shown, then washed off with clean cold water. In a few days after this treatment a scar

### (Theatrical Paints)

forms, which contains the tattoo mark or stain; remove it, and should inflammation supervene, poultice and bathe with warm water. In this way the skin with the stain is not only removed almost painlessly, but the nitric acid at the same time, to a certain extent, seems to decolorize the stain. Of course large tattoo marks, greatly extending over the surface, must necessitate the operation being performed differently.

5.—Tattoo the skin in the usual way with a concentrated solution of tannin, following the original design. Then apply a crayon of nitrate of silver until the part tattooed with the tannin blackens. Wipe off excess of moisture and allow matters to take their own course. Slight pain continues for two to four days, and after two months the cicatrix which results, will almost disappear.

#### Theatrical Paints, Powders, etc.

*Beards and Mustaches, False.*—Spirit Gum for.—1.—Spirit gum is the name applied to an alcoholic solution of rosins employed for fastening false beards to the face. Mastix, 2 gr.; sandarac, 4 gr.; rosin, 12 gr.; ether, 2 gr.; alcohol, 16 gr.  
2.—Mastix, 1 oz.; ether, 2 oz.; alcohol, 4 oz.

3.—Mastic dissolved in alcohol.

4.—Sandarac dissolved in ether, amount to be found by trial.

5.—Shellac dissolved in alcohol.

6.—A good quality of collodion.

7.—The face is cleaned, after removal of the beard, by wiping with a rag moist with alcohol.

8.—Varnish.—For affixing mustaches: Rosin, 4 parts; oil ricini, 1 part; methylated spirit, 16 fl. pt. Dissolve, strain and perfume.

*Cold Cream.*—Spermacetic, 1 lb.; white wax, 3 lb.; liquid petrolatum, 2 gal.; borax, 4 oz.; water, 1 gal.; enough perfume.

*Eyebrow Pencil.*—Suet, ¼ lb.; curd soap, ¼ lb.; ivory black, q. s. Put in a metal case or roll into spalls.

*Eyes, Black.*—Paint for.—Bismuth, 2 parts; talc, 1 part; color with carmine to skin tint. Wash the part with mixture of glycerine, 1 part; water, 5 parts; dry and apply powder.

*Face Paint.*—1.—Black.—a.—Best lampblack, 1 gram; cacao butter, 6 grams; oil neroli, 5 drops. Melt the cacao butter, add the lampblack, and while cooling make an intimate mixture, adding the perfume toward the last. In a similar manner you can prepare brown face paints by using finely levigated

## Toilet Preparations

### (Theatrical Paints)

burnt umber instead of lampblack, or for a reddish-brown, sienna or similar dry powders. The cost of the cacao butter is considerable. You can easily devise a base, being careful to guard against rancidity, if lard is a component, by carefully benzoinating it.

b.—Drop black (made by burning camphor and washing the soot with spirit), 2 dr.; almond oil, 2 dr.; coconut oil, 6 dr. Mix, perfume and cast into sticks.

c.—Nigger Black.—(1) Beat the finest lampblack into a stiff paste with glycerine and apply with a sponge. If necessary, add a little water to the mixture when using. (2) Make a "grease paint" as follows: Drop black, 2 dr.; almond oil, 2 dr.; coconut oil, 6 dr.; oil of lemon, 5 minims; oil of neroli, 1 minim. Mix.

2.—Brown.—The general principle in making such preparations consists in mixing the dry powder, a little darker than the desired tint, with some fat, such as petrolatum or lard.

3.—Grease Paints, etc.—a.—Skin Color.—Vermilion, 3 dr.; tincture of saffron, 2 dr.; powdered orris, 5 dr.; precipitated chalk and oxide of zinc, of each 20 dr.; camphor, 20 gr.; oil of peppermint, 20 minims; almond oil, a sufficiency. Perfume with bouquet essence, as in the foregoing.

b.—Fatty face powders have a small percentage of fat mixed with them in order to make the powder adhere to the skin. Dissolve 1 dr. anhydrous lanoline in 2 dr. of ether in a mortar. Add 3 dr. of light magnesia. Mix well, dry and then add the following: French chalk, 2 oz.; powdered starch,  $1\frac{1}{2}$  oz.; boric acid, 1 dr.; perfume, a sufficient quantity. A good perfume is coumarin, 2 gr., and otto of rose, 2 minims.

c.—Stick Grease Paint.—White beeswax, 2 oz.; prepared suet, 3 oz.; bismuth oxy carbonate, 5 oz. The melted basis may be colored to any desired tint by the use of aniline oil, soluble "fettfarbe" colors, or with vermilion, carmine, lampblack, sienna and other inorganic colors. The melted and tinted basis is run into suitable molds, such as glass tubes, and rolled when cold in waxed paper and tin-foil.

d.—Yellows are obtained with ocher, browns with burnt umber and blue is made with ultramarine. These colors should in each case be levigated finely along with their own weight of equal parts of precipitated chalk and oxide of zinc and diluted with the same to the tint required, then made into sticks with

### (Theatrical Paints)

mutton suet (or vaseline or paraffine, equal parts) well perfumed. By blending these colors other tints may thus be obtained.

4.—Red Paint.—a.—About 1 part carmine to 40 of finished paint is the proper proportion. Dissolve 1 part carmine in sufficient aqua ammonia (4 to 8 parts). Mix with 6 parts of powdered talc, dry, powder and mix with white meal,  $13\frac{1}{2}$  parts; olive or sweet almond oil,  $20\frac{1}{2}$  parts.

b.—Bright Red.—Oxide of zinc, subnitrate of bismuth and plumbate of alumina, of each 10 dr.; eosin,  $2\frac{1}{4}$  gr. (dissolved in a dr. of essence bouquet); oil of peppermint, 12 minims; camphor, 12 gr.; almond oil, a sufficiency to make a paste. Mix as above.

c.—Deep Bordeaux Red.—Oxide of zinc, subnitrate of bismuth, plumbate of alumina, of each 15 dr.; oil of peppermint, 12 minims; camphor, 12 gr.; carmine, 30 gr. (dissolved in 80 minims of water in ammonia); almond oil, a sufficiency. Perfume with  $1\frac{1}{2}$  dr. bouquet essence.

5.—Rouge.—a.—Base.—Cornstarch, 4 dr.; powdered white talcum, 6 dr. Mix.

b.—Carminolin, 10 gr.; base, 6 dr.; water, 4 dr. Dissolve the carminolin in the water, mix with the base and dry.

c.—Geranium red, 10 gr.; base, 6 dr.; water, 4 dr. Mix as above and dry.

d.—Carminolin rouge No. 1, 1 oz.; geranium rouge No. 2, 3 oz. Mix in a mortar to a paste with water and mold or stamp out. Set aside to dry.

6.—Vermilion.—Vermilion, 3 dr.; tincture of saffron, 2 dr.; powdered orris, 5 dr.; precipitated chalk and oxide of zinc, of each 20 dr.; camphor, 20 gr.; oil of peppermint, 20 minims; essence bouquet,  $1\frac{1}{2}$  dr.; almond oil, a sufficiency. Mix.

7.—White Paint.—a.—White meal, 2 parts; olive or almond oil, 2 parts; powdered talc, 1 part; oxide of zinc,  $\frac{1}{2}$  part.

b.—Oxychloride of zinc, 5 parts; white wax, 2 parts; sweet almond oil, 5 parts.

c.—Oxide of zinc, subnitrate of bismuth and plumbate of alumina, of each 1 oz. Mix and make into a paste with almond oil (5 or 6 dr. required) and perfume with 12 minims of oil of peppermint, 12 gr. of camphor and 1 dr. of bouquet essence.

d.—Liquid Blanc de Perle (for theatrical use).—Rose or orange flower water, 1 pt.; oxide of bismuth, 4 oz. Mixed by long trituration.

*Freckles. Imitation of.*—"Spot" the actor's face with a little burnt umber worked up in the same fatty base you

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employ for making face paints. Several adhesive substances may be suggested, but the above will probably answer.

*Linings Pencils for Theatricals.*—Stearine, 1 oz.; finely powdered plumbago, 1 oz.; prepared suet, 2 oz. Melt the fats, add the plumbago and run into glass tube molds.

*Nose Paste or Putty.*—1.—Wheat flour, 1 oz.; powdered tragacanth, 2 dr. Tint with carmine. Take as much of the powder as necessary, knead into a stiff paste with a little water and apply to the nose, having previously painted it with spirit gum.

2.—White wax, 8 parts; white rosin, 8 parts; mutton suet, 4 parts; color to suit. Mix together.

*Powders.*—1.—Red Powder.—Powdered Venetian tale, 100 grams; carmine, 2.5 grams; water of ammonia, 20 grams. Digest the carmine in the water of ammonia until dissolved, mix the solution with a portion of the powdered tale, and this with the remainder, and dry by exposure to the air.

2.—White Powder.—Powdered Venetian tale, 300 grams; bismuth oxychloride, 50 grams; carmine, .05 gram; oil bergamot, 10 drops; oil neroli, 2 drops.

*Wigs, Wax for.*—Elemi rosin, 1 gr.; tallow, 85 gr.; white wax, 170 gr.; turpentine (thick), 170 gr.; rosin, 565 gr. Melt together, and when partly cool add 56 grams of starch previously triturated with 5 parts of balsam of Peru.

### Teeth, The.

These should be well cleaned with a soft brush and powder every morning before breakfast. After dinner or other meal they may have the brush passed lightly round them for a few seconds, and the mouth should be washed out with a weak solution of permanganate of potash or other antiseptic. To scrub the teeth, more especially if the brush be hard, several times daily, is injurious to their structure.

*Arnica Dentifrice.*—Powdered quillaja, 4 oz.; powdered orris root, 3 oz.; precipitated chalk, 3 oz.; tincture myrrh, 1 dr.; f. e. arnica, 2 dr.; oil rose geranium, 30 drops; oil sandalwood, 5 drops.

*Aromatic.*—Star anise, 1 oz.; soap bark, 3 oz.; cloves, 2 dr.; cinnamon, 2 dr.; oil peppermint, 12 minims; cudbear, 1 dr.; diluted alcohol, 28 oz. Macerate the drugs with the alcohol for 3 or 4 days, filter and add the essential oil.

*Astringent.*—Rhatany, 100 parts; cinnamon, 5 parts; distilled water, 80 parts; alcohol, 20 parts; salicylic acid, 1 part.

### (Tooth Preparations)

Pulverize the rhatany and cinnamon, mix the ingredients, macerate and for each 32 oz. of liquid add 10 drops of oil of peppermint, 2 drops of oil of cloves and 1 drop of oil of ylang-ylang.

*Astringent Cinchona.*—Tincture orris (made by percolation, 1 in 4); lavender water, 1½ oz.; tincture cinnamon, ½ oz.; tincture yellow cinchona bark, 1 oz.; eau de cologne, 2 oz.

*Borax and Myrrh.*—Myrrh, 1½ oz.; borax, 1½ oz.; distilled water, 3 oz.; syrup, 4 oz.; tincture of rhatany, 1 oz.; eau de cologne, 24 oz. Macerate for 7 days, strain and filter.

*Eau Dentifrice.*—Star anise seed, 30 parts; oil anise, 5 parts; oil peppermint, 5 parts; alcohol, 400 parts; alkanet root to color.

*Foaming Tooth Wash.*—Quillaja bark, in coarse powder, 4 oz.; glycerine, 3 oz.; rectified spirit, 5 oz.; water, 30 oz. Macerate for 7 days and filter through 2 dr. of magnes. carb., with which have been mixed oil of wintergreen, 20 drops, and oils of neroli and cloves, 1 drop each. Finally add 1 dr. each of benzoic acid and tincture of pellitory. Color with cochineal or saffron.

*Foamy Mint.*—Castile soap, 3 oz.; glycerine, 5 oz.; water, 20 oz.; alcohol, 30 oz.; oil peppermint, oil wintergreen, oil orange, oil anise, oil cassia, of each 1 dr. Beat up the soap with the glycerine and water in a mortar. Dissolve the oils in the alcohol and pour upon the soap solution contained. Color to suit with solution of carmine.

*Formalbenzoin.*—Formaldehyde, 50 grams; tincture benzoin, 200 grams; tincture myrrh, 50 grams; oil peppermint, 3 grams; oil anise, 2 grams; oil cassia, 1 gram; oil cinnamon, 1 gram; cochineal, powdered, 2 grams; alcohol, 1,000 grams.

*Liquid Dentifrice.*—1.—Powdered krameria, 100 parts; powdered cinnamon, 50 parts; distilled water, 800 parts; alcohol (90%), 200 parts; salicylic acid, 10 parts; peppermint oil, 10 drops; clove oil, 2 drops; ylang ylang oil, 1 drop. Macerate 8 days and filter.

2.—(Said to resemble odol).—Salol, 25 grams; saccharine, .04 gram; oil peppermint, 5 grams; oil cloves, 1 gram; oil caraway, 0.5 gram; rectified spirit to 1 l.

*Mint and Cedar.*—Oil peppermint, 30 minims; oil spearmint, 15 minims; oil cloves, 5 minims; oil red cedar, 60 minims; tincture myrrh, 1 oz.; alcohol, 16 oz.; tincture cochineal to color.

*Myrrh Mixture, Emulsion or Milk of.*—Myrrh Water.—1.—Myrrh, ¼ oz. Powder it, add of thick mucilage, 2 fl.dr.

## Toilet Preparations

### (Tooth Preparations)

Triturate to a perfectly smooth paste, and, triturating all the time, add gradually of warm water,  $\frac{1}{2}$  pt. Agitate the whole till cold and then strain the liquid through muslin.

2.—Cuttle fish bone, 6 oz.; burnt hartshorn, 2 oz.; myrrh, 2 oz.; orris root, 2 oz. Mix. A good powder, often serviceable in foul gums, loose teeth, etc.

3.—Myrrh and Borax.—Tinct. myrrhæ, 4 oz.; tinct. rhataniæ, 1 oz.; glycerin-boracis, 1 oz.; syrupus, 1 oz.; aque destillata, 8 oz.; aque coloniensi, 3 oz.; alcohol, 20 oz. Mix the glycerin and borax and the syrup with the water and then add the alcohol and eau de cologne and finally the two tinctures.

*Nozodont*.—This much advertised tooth wash is said to consist of soap, 5 parts; glycerin, 6 parts; spirits, 30 parts; water, 20 parts. Flavored with several oils, colored; chalk and magnesia.

*Pastes and Powders*.—The necessary properties of a tooth powder are cleansing power unaccompanied by any abrading or chemical action on the teeth themselves, a certain amount of antiseptic power to enable it to deal with particles of stale food and a complete absence of any disagreeable taste or smell. The mouth should be rinsed out very thoroughly the moment the teeth-clearing operation is at an end. The following is a selection from a collection of the best known recipes for tooth powders and pastes:

1.—Charcoal and sugar, equal weights. Mix and flavor with clove oil.

2.—Charcoal, 156 oz.; red kino, 156 oz.; sugar, 6 oz. Flavor with peppermint oil.

3.—Charcoal, 270 oz.; sulphate of quinine, 1 oz.; magnesia, 1 oz. Scent to liking.

4.—Charcoal, 30 oz.; cream of tartar, 8 oz.; yellow cinchona bark, 4 oz.; sugar, 15 oz. Scent with oil of cloves.

5.—Sugar, 120 oz.; alum, 10 oz.; cream of tartar, 20 oz.; cochineal, 3 oz.

6.—Cream of tartar, 1,000 oz.; alum, 100 oz.; carbonate of magnesia, 375 oz.; sugar, 375 oz.; cochineal, 75 oz.; essence Ceylon cinnamon, 90 oz.; essence cloves, 75 oz.; essence English peppermint, 45 oz.

7.—Sugar, 200 oz.; cream of tartar, 400 oz.; magnesia, 400 oz.; starch, 400 oz.; cinnamon, 32 oz.; mace, 11 oz.; sulphate of quinine, 16 oz.; carmine, 17 oz. Scent with oil of peppermint and oil of rose.

8.—Bleaching powder, 11 oz.; red coral, 12 oz.

### (Tooth Preparations)

9.—Red cinchona bark, 12 oz.; magnesia, 50 oz.; cochineal, 9 oz.; alum, 6 oz.; cream of tartar, 100 oz.; English peppermint oil, 4 oz.; cinnamon oil, 2 oz. Grind the first five ingredients separately, then mix the alum with the cochineal, and then add to it the cream of tartar and the bark. In the meantime the magnesia is mixed with the essential oils, and finally the whole mass is mixed through a very fine silk sieve.

10.—Whitewood charcoal, 250 oz.; cinchona bark, 125 oz.; sugar, 250 oz.; peppermint oil, 12 oz.; cinnamon oil, 8 oz.

11.—Pumice, 250 oz.; white coral, 250 oz.; cuttle bone, 250 oz.; cream of tartar, 250 oz.; Florence orris root, 250 oz.; sal ammoniac, 60 oz.; ambergris, 4 oz.; cinnamon, 4 oz.; coriander, 4 oz.; cloves, 4 oz.; rosewood, 4 oz.

12.—Dragon's blood, 250 oz.; cream of tartar, 30 oz.; Florence orris root, 30 oz.; cinnamon, 16 oz.; cloves, 8 oz.

13.—Red coral, 250 oz.; cuttle bone, 250 oz.; dragon's blood, 250 oz.; red sandalwood, 125 oz.; alum, 125 oz.; orris root, 250 oz.; cloves, 15 oz.; cinnamon, 15 oz.; vanilla, 8 oz.; rosewood, 15 oz.; carmine lake, 250 oz.; carmine, 8 oz. This tooth powder is said to be a favorite in America.

14.—Cream of tartar, 150 oz.; alum, 25 oz.; cochineal, 12 oz.; cloves, 25 oz.; cinnamon, 25 oz.; rosewood, 6 oz. Scent with essence of rose.

15.—Coral, 20 oz.; sugar, 20 oz.; wood charcoal, 6 oz.; essence of vervain, 1 oz.

16.—Precipitated chalk, 500 oz.; orris root, 500 oz.; carmine, 1 oz.; sugar, 1 oz.; essence of rose, 4 oz.; essence of neroli, 4 oz.

17.—Cinchona bark, 50 oz.; chalk, 100 oz.; myrrh, 50 oz.; orris root, 100 oz.; cinnamon, 50 oz.; carbonate of ammonia, 100 oz.; oil of cloves, 2 oz.

18.—Gum arabic, 30 oz.; cutch, 80 oz.; licorice juice, 550 oz.; cascarrilla, 20 oz.; mastic, 20 oz.; orris root, 20 oz.; oil of cloves, 5 oz.; oil of peppermint, 15 oz.; extract of amber, 5 oz.; extract of musk, 5 oz.

19.—Chalk, 200 oz.; cuttle bone, 100 oz.; orris root, 100 oz.; bergamot oil, 2 oz.; lemon oil, 4 oz.; neroli oil, 1 oz.; Portugal oil, 2 oz.

20.—Borax, 50 oz.; chalk, 100 oz.; myrrh, 25 oz.; orris root, 22 oz.; cinnamon, 25 oz.

21.—Wood charcoal, 30 oz.; white honey, 30 oz.; vanilla sugar, 30 oz.; cinchona bark, 16 oz. Flavor with oil of peppermint.

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22.—Syrup of 33° B., 38 oz.; cuttle bone, 200 oz.; carmine lake, 30 oz.; English oil of peppermint, 5 oz.

23.—Red coral, 50 oz.; cinnamon, 12 oz.; cochineal, 6 oz.; alum, 2½ oz.; honey, 125 oz.; water, 6 oz. Triturate the cochineal and the alum with the water. Then, after allowing them to stand for 24 hours, put in the honey, the coral and the cinnamon. When all the effervescence has ceased, which happens in about 48 hours, flavor with essential oils to taste.

24.—Well-skimmed honey, 50 oz.; syrup of peppermint, 50 oz.; orris root, 12 oz.; sal ammoniac, 12 oz.; cream of tartar, 12 oz.; tincture of cinnamon, 3 oz.; tincture of cloves, 3 oz.; tincture of vanilla, 3 oz.; oil of cloves, 1 oz.

25.—Honey, 250 oz.; precipitated chalk, 250 oz.; orris root, 250 oz.; tincture of opium, 7 oz.; tincture of myrrh, 7 oz.; oil of rose, 2 oz.; oil of cloves, 2 oz.; oil of nutmeg, 2 oz.

Pastes.—1.—Collapsible Tubes, Tooth Paste for. —Precipitated chalk, 8 oz.; orris root, 8 oz.; oil of cloves, 1 dr.; honey enough to form a paste.

2.—Diatomite Tooth Paste.—Diatomite, 6 oz.; burnt alum, 1 oz.; powdered myrrh, 1 oz.; oil cloves, 24 minims; glycerine, 2 oz.; tincture cochineal to color.

3.—Eucalyptus Tooth Paste.—Precipitated chalk, 50 gr.; Venetian tale, 30 gr.; starch, 20 gr.; medicinal soap, 20 gr.; eucalytol, 2 gr.; oil peppermint, 1 gr.; oil geranium, 1 gr.; oil cloves, 10 gr.; oil anise, 10 gr.; carmine, 1 gr.; glycerine and alcohol enough.

4.—Mentholated Tooth Cream.—Precipitated chalk, 8 av.oz.; white Castile soap (powder), 4 av.oz.; magnesium carbonate, 2 av.oz.; menthol (dissolved in alcohol), solution carmine, glycerine, of each sufficient. Rub the first three ingredients into a paste with glycerine, then flavor and color to suit with the menthol and carmine solutions.

5.—Myrrh Tooth Paste.—a.—Precipitated chalk, 8 oz.; orris, 8 oz.; white Castile soap, 2 oz.; borax, 2 oz.; myrrh, 1 oz.; glycerine, q. s. Color and perfume to suit.

b.—Precipitated chalk, 54 parts; arrowroot, 5 parts; powdered myrrh, 7 parts; cinnamon, 1 part. Sufficient glycerine to make a paste. A mixture 1 part glycerine and 2 parts chloroform water is better than glycerine alone.

c.—Take sugar of milk, 100 parts; pure tannin, 15 parts; lake, 10 parts; oils of mint, aniseed and orange flowers, sufficient quantity. Rub together the

### (Tooth Preparations)

lake and tannin, gradually add the sugar of milk and then the oils.

6.—Salicylated Tooth Paste.—Precipitated chalk, 16 av.oz.; white Castile soap (powder), 4 av.oz.; sugar (powder), 4 av.oz.; orris (powder), 4 av.oz.; pumice (powder), 1½ av.oz.; sodium salicylate, 80 gr.; glycerine, 2 fl.oz.; carmine or solution of carmine sufficient to color; water sufficient to form a mass. Mix well and perfume with oil of peppermint, wintergreen or other oil.

7.—Thymol Tooth Paste.—Calcium carbonate, 16 av.oz.; magnesium carbonate, ¼ av.oz.; orris root (powder), 3 av.oz.; thymol, 60 gr. Mix well and make a mass with sufficient of the following mixture: Gelatine (pure), 70 gr.; glycerine, 3 fl.oz.; water, 1 fl.oz. Dissolve by the application of a gentle heat.

8.—Violet Tooth Powder.—Prepared chalk, 3 oz.; cuttlefish bone, powdered, 2 oz.; white sugar, powdered, 2 oz.; orris root, powdered, 1 oz.; smalts, 2 to 3 dr.; syrup of violets, to mix, q. s. A fashionable tooth paste, highly esteemed for its power of cleaning the teeth and its delicate color and odor.

9.—Cream of tartar, 120 oz.; pumice, 120 oz.; alum, 30 oz.; cochineal, 30 oz.; bergamot oil, 3 oz.; cloves, 3 oz. Make to a thick paste with honey or sugar.

Powders.—1.—Cuttlefish powder, 8 oz.; rock alum, 1 oz.; cream of tartar, 2 oz.; orris root, 1 oz.; burnt hartshorn, 2 oz.; oil of rhodium, 6 drops.

2.—Prepared chalk, 2 oz.; cuttlefish, 1 oz.; orris root, 1 oz.; myrrh, ½ oz.; sulphate of quinine, 10 gr.

3.—Orris root, 4 oz.; cuttlefish, 2 oz.; cream of tartar, 1 oz.; myrrh, ½ oz.; oil of cloves, 16 minims.

4.—Peruvian bark, 1 oz.; cream of tartar, 2 dr.; myrrh, 1 dr.; cuttlefish, 4 dr.; oil of cloves, 8 drops.

5.—Cuttlefish, 8 oz.; cream of tartar, 4 oz.; orris root, 2 oz.

6.—Prepared chalk, 4 oz.; cuttlefish bone, 3 oz.; orris root, 2 oz.; dragon's blood, 1 oz.; oil or essence (as last), ½ dr. Mix: 1 or 2 oz. of red bole or rose pink are often added.

7.—Anadoli.—Powdered soap, 42 parts; starch powder, 44 parts; levantine soapwort, 12 parts; oil of bergamot and lemon to color.

8.—Antiseptic Strontium Tooth Powder.—Strontium carbonate, 150 gr.; prepared chalk, 375 gr.; calcined magnesia, 375 gr.; salol, 90 gr.; thymol, 15 gr.; carmine solution, enough; oil of peppermint, enough.

9.—Astringent Tooth Powder.—Myrrh,

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### (Tooth Preparations)

1; sodium chlorate, 1; soap, 0.50; calcium carbonate, precipitated, 50; rose oil.

10.—Camphor Tooth Powder.—Camphor, 0.500; soap, 1; saccharine, 0.025; thymol, 0.050; calcium carbonate, precipitated, 50; oil of saffron, 1 to 2 drops.

11.—Camphorated Chalk.—Camphor, 1 oz.; precipitated chalk, 15 oz. Prepared chalk may be used in lieu of precipitated chalk. Less white and velvety, but cleans the teeth better than the softer article.

12.—Coral Tooth Powder, Coral Dentifrice.—Red coral, 3 oz.; red bole, 3 oz.; cuttlefish bone, 3 oz.; dragon's blood, 1½ oz.; cinnamon, ¾ oz.; cochineal, 3 dr.; cloves, 1 dr.; cream of tartar, 4½ oz.

13.—Impalpably pulverized charcoal, 1 oz.; sugar, 1 oz.; volatile oil of cloves, 3 drops. Make into a homogeneous powder under a muller.

14.—Impalpably pulverized charcoal, 1 oz.; red bark, 1 oz.; pulverized sugar, 4 dr.; volatile oil of mint, 4 drops.

15.—Impalpably pulverized charcoal, 1 oz.; sulphate of quinine, 2 gr.; magnesin, 2 gr. Perfume with some drops of rose water or essence of mint, cinnamon, or with powdered rose leaves, or orris root.

16.—Diatomite Tooth Powder.—Diatomite, 1 oz.; precipitated chalk, 1 oz.; powdered soap, 1 oz.; oil of rose, 2 minims; oil of clove, 1 minim; spirit of peppermint, 5 minims; milk sugar, 1 dr.

17.—Farina Tooth Powder (Piesse).—Burnt horn, 2 lb.; orris root, 2 lb.; carmine, 1 dr.; very fine powdered sugar, ½ lb.; otto of neroli, ½ dr.; otto of lemon, ¼ oz.; otto of bergamot, ¼ oz.; otto of orange peel, ¼ oz.; otto of rosemary, 1 dr.

18.—Oxygen Tooth Powder.—Precipitated chalk, 6 dr.; sodium perborate, 1 dr.; powdered soap, 20 gr.; oil of wintergreen, 15 minims.

19.—Piesse & Lubin's Tooth Powder.—Precipitated chalk, 1 lb.; orris powder, 1 lb.; carmine, ½ dr.; powdered sugar, ¼ lb.; otto of roses and neroli, of each, 1 dr.

20.—Salol Tooth Powder.—Salol, 4 grams; lime phosphate, 20 grams; lime carbonate, 20 grams; magnesin carbonate, 20 grams; sodium bicarbonate, 15 grams; peppermint oil, in suitable quantity.

21.—Thymol Dentifrice.—Thymol, 3 grams; benzoic acid, 30 grams; tincture of eucalyptus, 150 c.c.; oil of peppermint, 7.5 c.c.; alcohol, 1,000 c.c.

22.—Violet Tooth Powder.—a.—Precipitated chalk, 16 lb.; powdered orris, 4 lb.; powdered cuttlefish bone, 2 lb.; ultramarine, 9½ oz.; geranium lake, 340 gr.; jasmine, 110 minims; oil of neroli, 110

### (Tooth Preparations)

minims; oil of bitter almonds, 35 minims; vanillin, 50 gr.; artificial musk (Lautier's), 60 gr.; saccharine, 140 gr. Rub up the perfumes with 2 oz. of alcohol, dissolve the saccharine in warm water, add all to the orris, and set aside to dry. Rub the colors up with water and some chalk, and when dry pass all through a mixer and sifter twice to bring out the color.

b.—Precipitated chalk, 6 oz.; cuttlefish bone, 3 oz.; bright rose pink, 2½ oz.; orris root, 1½ oz.; essence of violets (orris), ½ fl.dr.; indigo (pure, to strike a violet tint), q. s.

c.—Betanaphthol, 0.05; saccharine, 0.025; soap, 1; calcium carbonate, precipitated, 50; ionon and oil of cannanga, of each, 1 to 2 drops.

Soaps.—1.—Antiseptic Tooth Soap.—Thymol, 25 parts; extract of rhatany, 100 parts; warm glycerine, 600 parts; calcined magnesin, 50 parts; borax, 400 parts; oil of peppermint, 100 parts; medicinal soap, enough to make 3,000 parts. Dissolve the thymol and extract of rhatany in the warm glycerine, and add the other ingredients, stirring constantly.

2.—Castile soap, in powder, 200 parts; glycerine, 5 parts; salicylic acid, 5 parts; oil of anise, 10 parts; carmine, sufficient; eosin, sufficient. Rub up the carmine and eosin with a small amount of the powdered soap, then add the rest of the soap, and the oil, and rub well together. Dissolve the acid in glycerine, add the solution, under constant rubbing. Finally, add sufficient glycerine to make a paste of the desired consistency.

3.—White Castile soap, powdered, 10 av.oz.; tincture of rhatany, 3¼ fl.oz.; precipitated chalk, 3¾ av.oz.; benzoic acid, ½ av.oz.; powdered potassium chlorate, ¾ av.oz.; powdered borax, ¾ av.oz.; saccharine, 40 gr.; oil of cinnamon, sufficient to flavor. Make into a hard mass by the addition of glycerine and water, press into tin boxes, and dry.

4.—Castile soap, 1 lb.; prepared chalk, 1 oz.; carbolic acid, 20 gr.; oil of wintergreen, 30 minims. Shave the soap into ribbons, beat into a paste with a little water, and add, first, the prepared chalk, and lastly the carbolic acid and wintergreen oil, dissolved in a little alcohol.

### Toothache Remedies.

*Odontalgic Drops.*—As nearly all of them contain highly volatile ingredients, such as ether, alcohol, etc., they should be kept in closely stoppered or corked bottles, and the mouth should be closed immediately on their application, and kept

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so for some time. As many of them contain active ingredients, care should also be taken not to swallow them.

1.—Liquor of ammonia (0.880-0.885), 1 part; 90% alcohol, 3 or 4 parts. A little oil of cloves or of cajeput, or of both, is sometimes added. Very effective, if properly applied.

2.—Ether,  $1\frac{1}{2}$  fl.dr.; alcohol,  $1\frac{1}{2}$  fl.dr.; camphor, 1 dr. Dissolve, and add of liquor of ammonia (0.880-0.885),  $\frac{1}{2}$  fl.dr. Very serviceable.

3.—Creosote, 1 dr.; 90% alcohol, 1 dr.; oil of cloves,  $\frac{1}{2}$  fl.dr. Excellent for rotten or decayed teeth.

4.—Hydrochlorate of morphia, 30 gr.; concentrated tincture of pellitory (made with 90% alcohol),  $2\frac{1}{2}$  fl.oz.; oil of cloves,  $\frac{1}{2}$  fl.oz.; chloroform,  $\frac{1}{2}$  fl.oz. Agitate them together until mixed. Used as toothache drops, observing to shake the bottle well before use, and to keep it closely corked or stoppered, and in a cool place. An excellent remedy.

5.—*American Toothache Drops*.—Those which took the prize at Vienna consisted of common salt and brandy, colored with harmless cochineal red.

6.—*Dr. Blake's*.—Alum, in fine powder, 1 dr.; sweet spirits of niter, 1 fl.oz. Agitate them together occasionally for an hour. A bad chemical mixture, of little value, since the alum is nearly insoluble in the intended menstruum. Sweet spirits of niter is a name for an alcoholic solution of nitric ether.

7.—*Borhaave's Odontalgic*.—Opium,  $\frac{1}{2}$  troy dr.; powdered camphor, 4 or 5 av.dr.; oil of cloves, 2 fl.dr.; 90% alcohol, strongest,  $1\frac{1}{2}$  fl.oz. Agitate the mixture occasionally for a week, and after repose pour off the clear portion. Often serviceable, and much esteemed by some persons as toothache drops.

8.—*Dr. Copland's*.—Powdered opium, 10 gr.; camphor, 10 gr.; oil of cloves, 1 dr.; oil of cajeput, 1 dr.; 90% alcohol, strongest,  $\frac{1}{2}$  fl.oz.; ether,  $\frac{1}{2}$  fl.oz. Mix, and agitate the bottle occasionally for a day or two, as the last.

9.—*Cottrean's*.—A nearly saturated ethereal solution of camphor, to which as much of the strongest liquor of ammonia is added as can be without clouding the liquid. If the latter occurs, the addition of a few drops of alcohol will restore it. A useful remedy.

10.—*Righini's*.—Creosote, 5 dr.; rectified spirit, 5 fl.dr.; tincture of cochineal, strong, 2 fl.dr.; oil of peppermint, English,  $\frac{1}{2}$  dr. Mix. Resembles No. 3.

### (Wrinkles)

*Pastes for the Toothache, Odontalgic Pastes, Paste Odontalgica, Pâtes Odontalgiques*.—1.—Root bark of pellitory, 1 dr.; hydrochlorate of morphia, 5 gr. Triturate until reduced to fine powder, then add of finest thick honey, 3 dr.; oil of cloves or cajeput, 20 drops; concentrated tincture of pellitory, q. s. Form the whole into a smooth paste. Very effective.

2.—Pellitory root, in fine powder, 1 part; mastic, in fine powder, 1 part; white sugar, in fine powder, 1 part; chloroform, q. s. Make them into a paste, and at once put it in a stoppered bottle. It must be kept in a cool place.

3.—*De Handel's*.—Powdered opium,  $\frac{1}{2}$  dr.; powdered camphor, 1 dr.; extract of belladonna, 1 dr.; extract of henbane, 1 dr.; oil of cajeput, 15 drops; tincture of cantharides, 15 drops. Mix, adding distilled lettuce water, q. s. to form a paste.

4.—*Rust's*.—Powdered opium, 10 gr.; extract of henbane, 10 gr.; powdered pellitory root, 20 gr.; extract of belladonna, 20 gr.; oil of cloves, 15 drops. Mix thoroughly.

5.—*Turton's*.—Pellitory root, powdered, 1 dr.; powdered lump sugar, 1 dr.; powdered camphor, 30 gr.; concentrated tincture of pellitory, q. s. To form a paste.

6.—*Vohler's*.—Powdered dragon's blood, 1 dr.; powdered opium, 2 dr.; powdered gum mastic, 4 dr.; powdered gum sandarac, 4 dr.; oil of rosemary, 25 drops; tincture of opium, q. s. To form a paste.

A small quantity of one of the preceding is inserted in the hollow of the aching tooth, or placed against the corresponding gum. They must on no account be swallowed.

### Wrinkle Remover.

1.—White petrolatum, 7 av.oz.; paraffine wax,  $\frac{1}{2}$  av. oz.; lanolin, 2 av.oz.; water, 3 fl.oz.; oil of rose, 3 drops; vanillin, 2 gr.; alcohol, 1 fl.dr. Melt the paraffine, add the lanolin and petrolatum, and when these have melted pour the mixture into a warm mortar, and with constant stirring incorporate the water. When nearly cold add the oil and vanillin, dissolved in the alcohol. Preparations of this kind should be rubbed into the skin vigorously, as friction assists the absorbed fat in developing the muscles, and also imparts softness and fullness to the skin.

2.—Wrinkles on the face yield to a wash consisting of 50 parts of milk of almonds (made with rose water) and 4 parts of aluminum sulphate. Use morning and night.

## CHAPTER XXVI

# WATERPROOFING, FIREPROOFING AND FIRE EXTINGUISHING

### FIREPROOFING

#### Asbestos.

The name given to several varieties of amphibolitic and augitic minerals. It is now used to a large extent in the manufacture of non-conducting and fireproof articles, such as boiler coverings, paint, theater curtains, etc.

#### Paints, Fireproof. (See Paints.)

#### Paper and Ink.

1.—Mix from 5 to 75 parts of aluminum sulphate with 62½ parts of asbestos fiber. Moisten this mixture with chloride of zinc, and wash thoroughly with water. Treat with a solution composed of 20 to 25 parts of pure aluminum sulphate and 2½ parts of rosin soap. Afterward manufacture into paper in the same way as with ordinary pulp.

2.—Pass the paper through a strong solution of alum, and dry.

3.—Sulphate of ammonia, 8 kgm.; boric acid, 6 kgm.; borax, 2 kgm.; ordinary water, 100 kgm. Heat the mixture to 59° C. (138° F.).

4.—*Ink.* A free-flowing ink for writing on fireproof paper with an ordinary metallic pen may be obtained by using 5 parts of dry platinum chloride with 15 parts of oil of lavender, 15 parts of Chinese ink, and 1 part of gum arabic, adding thereto 64 parts of water. When the paper is ignited, after being written upon with this ink, the platinum ingredient causes the writing to appear transparent, and as a consequence it is claimed that such writing as has become black or illegible will become readily legible again during the process of heating the paper. Colors for painting may also be made fireproof by mixing commercial metallic colors with the chloride of platinum and painters' varnish, adding an ordinary aquarelle pigment to strengthen the covering power of the color. These fireproof

paints or colors can be easily used in the same manner as the common water colors, and it is claimed they will resist the destructive influence of great heat quite as successfully as the fireproof printing and writing inks just referred to.

#### Roofing.

1.—After the paper is put on, take coal tar and lime (burnt, but not slaked), and boil them together in the proportion of 15 lb. of lime to 100 lb. of tar. Put it on hot. To pulverize the lime, sprinkle it with a little water, and sift it. To avoid the tar boiling over, stir the lime in the boiling tar very slowly. The mixture must always be heated before putting on. The lime and tar form a chemical connection, which is fireproof, cannot be melted by sun heat or dissolved by steam or hot water, and makes a smooth, glazed roof.

2.—Take 1 measure of fine sand, 2 measures of sifted wood ashes and 3 measures of lime, ground up with oil. Mix thoroughly, and lay on with a painter's brush, first a thin coat and then a thick one. This composition is not only cheap, but strongly resists fire.

#### Tent Canvas and Other Coarse Cloth.

1.—Water, 100 l.; ammonium sulphate, chemically pure, 14 kgm.; boric acid, 1 kgm.; barthorn salt, 1 kgm.; borax, 3 kgm.; glue water, 2 kgm. Boil the water, put ammonium sulphate into a vat, pour a part of the boiling water on, and then add the remaining materials in rotation. Next follow the rest of the hot water. The vat should be kept covered until the solution is complete.

2.—Boil together, with constant stirring, the following ingredients until a homogeneous mass results: Linseed oil, 77 kgm.; litharge, 10 kgm.; sugar of lead, 2 kgm.; lampblack, 4 kgm.; oil of turpentine, 2 kgm.; amber, 0.4 kgm.; Japanese wax, 0.3 kgm.; soap powder, 1.2



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kgm.; manilla copal, 0.7 kgm.; caoutchouc varnish, 2 kgm.

#### Textile Fabrics.

1.—The first composition, which may be applied to all kinds of fabrics, without deteriorating them in any way, consists of sulphate of ammonia (pure), 8 lb.; carbonate of ammonia, 2.5 lb.; boracic acid, 3 lb.; pure borax, 1.7 lb.; starch, 2 lb.; water, 100 lb. It is simply necessary to steep the fabrics in a hot solution composed as above until they have become thoroughly impregnated, after which they are drained and dried sufficiently to enable them to be ironed or pressed like ordinary starched goods.

2.—As a sample of the Melunay process, introduced in France, the following has been published: Apply to a cotton fabric, like flannelette, or other cotton goods, a solution of stannate of soda (or a salt chemically equivalent), of the strength of 5 to 10° B.; then dry the fabric, and saturate it again, this time with a solution of titanium salt; any soluble titanium salt is suitable. This salt should be so concentrated that each liter may contain about 62 grams of titanium oxide. The fabrics are again dried, and the titanium is ultimately fixed by means of a suitable alkaline bath. It is advantageous to employ for this purpose a solution of silicate of soda of about 14° B., but a mixed bath, composed of tungstate of soda and ammonium chloride, may be employed. The objects are afterward washed, dried and finished as necessary for trade. A variation consists in treating the objects in a mixed bath containing titanium, tungsten, and a suitable solvent.

3.—(According to Elsner).—Dissolve sulphate of alumina in cold water, and add a solution of phosphate of ammonia as long as a precipitate is produced, and finally mix in sufficient sal ammoniac solution until the precipitate is dissolved again. The fabric is impregnated with this fluid.

4.—Bone ashes, 10 parts; water, 50 parts; sulphuric acid, 6 parts; allow to stand for 2 days at moderate heat, then add 100 parts of water, and filter. The fluid is first mixed with a solution of 5 parts of sulphate of magnesia (Epsom salts) in 15 parts of water, and then with so much ammonia that its excess may be detected by the odor. The resulting precipitate is pressed and dried. Two parts of this precipitate should be mixed with 1 part of tungstate of soda and 6 parts of wheat starch, blued with a little indigo-

### (Fireproofing)

carmine, and then boiled with enough water to produce a slimy fluid, with which the fabric must be saturated.

5.—Among the means recommended for this purpose we may, in the first place, mention one of exceeding simplicity, applicable to muslins and all dresses which are starched after washing. It is merely necessary to mix the starch with sal ammoniac and plaster of paris. The goods thus dressed may certainly be set on fire by the flame of a match, but the flame does not extend. The inventor of this first process afterward recommended: Borax, 12 parts; Epsom salts, 9 parts; dissolved in 80 parts of warm water. The tissues to be prepared are dipped in the solution till thoroughly saturated. They are then pressed, wrapped in a cloth, wrung again, laid between cloths, and passed through a mangle, after which the articles are ironed while still damp. The necessary quantity of starch can be stirred in the saline solution.

6.—Voight dissolves sublimed sal ammoniac, 2 parts; sulphate of zinc, 1 part; in 15 to 20 parts of water. The starch or other ingredients required for stiffening or finishing are added to the solution. The dresses, etc., are steeped in the mixture till thoroughly saturated, pressed well out and dried. According to Siebrath, a good result may be got by steeping the dresses in a solution containing 5% of alum and 5% of phosphate of ammonia. Tissues so treated are said not to burn, even if previously rubbed with gunpowder. The powder deflagrated, but left the tissue unburnt.

7.—Hottin proceeds in a very similar manner. He takes a solution of acid phosphate of lime, mixed with ammonia in excess. After decolorizing it with animal charcoal he adds 5% of gelatinous silica, and evaporates to dryness. The dresses to be made fireproof are laid in a 30% solution of this mixture, which he calls "Hottine." [If this mixture has once been evaporated to dryness, we do not see how it can be all brought into solution again without the aid of an acid. Acid phosphate of lime, if mixed with ammonia, will be precipitated as insoluble tribasic phosphate of lime, while the excess of the phosphoric acid will combine with the ammonia. So that the process is, in reality, merely a method of making phosphate of ammonia.]

8.—Among other agents proposed for the same purpose are soluble glass, tungstate of soda, ammonia, alum and hypsulphite of soda.

9.—According to Versman and Oppen-

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heim, phosphate of ammonia is mixed with half its weight of sal ammoniac, and a 20% solution of the mixture is used. Tissues which are to be afterward ironed are afterward treated with a 20% solution of the tungstate of soda.

10.—The phoenix essence of M. Pereles consists of a mixed solution of tungstate, silicate and phosphate of soda.

11.—Nicoll proposed a bath of alum, 6 parts; borax, 2 parts; tungstate of soda, 1 part; dextrine, dissolved in soap lye, 1 part. The dextrine is said to cause the salts to adhere better to the fiber.

12.—Sulphate of ammonia, 8 parts; carbonate of ammonia,  $2\frac{1}{2}$  parts; boric acid, 2 parts; borax,  $1\frac{3}{4}$  parts; starch, 2 parts; water, 100 parts. The dresses or other tissues are taken through this mixture boiling.

13.—Steep the fabric in almost any saline solution, such as borax, alum, sal ammoniac, etc. The addition of about 1 oz. of alum or sal ammoniac to the last water used to rinse a lady's dress, or set of bed furniture, or the addition of a less quantity to the starch used to stiffen them, renders them unflammable, or at least so little combustible that they will not readily take fire, and if kindled will not burst into flame.

14.—Make a solution of sodium tungstate, 28° Tw., mix with 3% of sodium phosphate.

### Theatrical Scenery, etc.

1.—A composition to be used for theatrical scenery (or the mounted but unpainted canvas to be used for this purpose), and also for woodwork, furniture, door and window frames, etc., is to be applied hot with a brush, like ordinary paint. It is composed of boric acid, 5 lb.; hydrochlorate of ammonia or sal ammoniac, 15 lb.; potash feldspar, 5 lb.; gelatine, 1.5 lb.; size, 50 lb.; water, 100 lb.; to which is added a sufficient quantity of a suitable calcareous substance to give the composition sufficient body or consistency.

2.—Chlorhydrate of ammonia, 15 kgm.; boric acid, 5 kgm.; softened glue, 5 kgm.; gelatine,  $1\frac{1}{2}$  kgm.; ordinary water, 100 kgm.; lime, q. s. The mixture is kept at 60 or 80° C. (140 to 176° F.) until it is of the consistency of oil. Spread it over the materials with a brush, like varnish. For scenery already painted, spread the liquid on the unpainted side. Care must be taken to cover twice over the frame and posts.

3.—Mix 15 kgm. of ammonium chloride with enough floated chalk to give the

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mass consistency; then heat to 50 to 60° C., and give the material one or two coats of it by means of a brush; 1 kgm. of it, costing about 4 to 5 cents, is sufficient to cover 5 sq. yd.

### Walls, etc.

A material for covering walls, or other substances needing such protection, may be made as follows: Talc, 90 parts; white dextrine, 11 parts; plaster of paris, 11 parts; calc spar, 4 parts; alum, 4 parts; cooking salt, 2 parts. Powder thoroughly and mix intimately. To use, stir 4 parts of this mixture in 3 parts of boiling water until a creamlike mass is obtained. Any desired color may now be stirred in. The cream is to be applied to the surface that one desires to protect. It is claimed to be proof against fire and water, which is easily and evenly applied, and which will not scale off.

### Wicks.

1.—To prepare lamp wicks so that they will not burn out, steep them in a concentrated aqueous solution of tungstate of soda, and then dry thoroughly in an oven.

2.—Sea sand, 15 parts; powdered fire-clay, 5 parts; fine wood sawdust, 10 parts; powdered glass,  $2\frac{1}{2}$  parts; cotton or cotton dust,  $2\frac{1}{2}$  parts. Moisten this mixture, dry, and fire at a full red heat for  $\frac{1}{2}$  hour. This is said to yield a permanent and porous material for lamp wicks.

### Woods.

1.—According to one authority, the most commendable process is by immersion in a saline solution composed as follows: Ammonium phosphate, 100 kgm.; boric acid, 10 kgm.; water, 1,000 l. Mix, and dissolve.

2.—To make applications of paints, plasters, etc., appreciably effective as fire preventers, they should be put on in numerous successive coatings. The following is the first formula for this form of protective: Liquid sodium silicate, 1,000 parts; Meudon white, 500 parts; glue, 1,000 parts. Mix.

3.—Make the following two solutions. Apply a coating of the first, let dry, and then apply the second: (a) Aluminum sulphate, 20 parts; water, 1,000 parts. (b) Liquid sodium silicate, 50 parts; water, 1,000 parts. Mix, and use as indicated above.

4.—Solid sodium silicate, 350 parts; powdered asbestos, 350 parts; boiling water, 1,000 parts. Mix. Give several coats.

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ings, letting each dry before applying the next.

5.—Powdered asbestos, 35 parts; sodium borate, 20 parts; water, 100 parts; gum lac, 10 to 15 parts. Dissolve the borax in the water by the aid of heat, and in the hot solution dissolve the lac. When solution is complete, incorporate the asbestos. These last solutions give a superficial protection, the efficiency of which depends upon the number of coatings given.

6.—*Shingles*.—a.—Shingle roofs, and indeed all woodwork, may be rendered less liable to take fire from falling cinders, etc., by coating it with a wash composed of lime, salt and fine sand or wood ashes. This compound also preserves the wood, and should be applied in the same manner as ordinary whitewash.

b.—Fireproof wash for shingles, etc. Dissolve in a barrel of hot water: Sulphate of zinc, 20 lb.; alum, 20 lb.; caustic potash, 8 lb.; manganate oxide, 8 lb.; and add sulphuric acid, 8 lb. Pack the shingles loosely in another barrel, and fill with the liquid, holding the shingles under the mixture. Fill up the first barrel also with shingles, soak for 3 hours, and pile to dry, and repeat until all the shingles are fireproofed. After the house is shingled, paint with oxide of iron paint, tempered with other mineral color in boiled linseed oil, and mixed to suit your taste as to shade of color.

### FIRE EXTINGUISHERS

#### Charging Fire Extinguishers.

The Babcock fire extinguisher is charged with a solution of bicarbonate of soda in water, and sulphuric acid in a lead bottle, which, when required, is turned over by a crank, spilling the acid into the charge of soda. Carbonic acid gas is instantly generated, by which a pressure is obtained sufficient for throwing the whole contents of the apparatus with much force through a nozzle for fire purposes. Use of sulphuric acid, 5 parts; bicarbonate of soda, 6 parts; by weight. Other combinations are used, such as carbonate of ammonia, potash, etc. Iron can be used for the alkaline reservoirs.

#### Chimney, To Extinguish Fire in.

Shut all the doors of the room, so as to prevent any current of air up the chimney; then throw a few handfuls of common fine salt upon the fire in the grate or stove. This will immediately extinguish the fire in the chimney. In the process of burning the salt, muriatic acid

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gas is evolved, which is a good extinguisher of fire.

#### Dry Chemical Fire Extinguishers.

1.—Dieterich gives the following formula for a chemical fire extinguisher. By a slight modification of it we have a recipe for making gunpowder: Potassium nitrate, 60 oz.; sulphur, 36 oz.; charcoal, 4 oz.; colcothar of rouge, 1 oz. Powder separately, dry, and mix. This powder is used by placing it in 5-lb. round paste-board boxes, through an orifice in which a fuse is inserted, an end being left hanging out. The extinguisher so made is intended for use in a closed room. It is supposed to act automatically by absorbing oxygen.

2.—Sodium chloride, 4 parts; sodium bicarbonate, 3 parts; sodium sulphate, 1 part; calcium chloride, 1 part; sodium silicate, 1 part.

3.—Sodium chloride, 3 parts; ammonium chloride, 3 parts; sodium bicarbonate, 4 parts.

#### Hand Grenades.

1.—Fill thin, spherical bottles of blue glass with a solution of calcium chloride, sal ammoniac or borax.

2.—We know of nothing quite so convenient and efficacious in fighting fires in a small way as carbonated water under pressure. This may be thrown from siphons or soda-water tanks, or from specially prepared apparatus. Not only may such water be directed from its container in a fine stream, but the carbon dioxide which it liberates rapidly, has a decided deterrent effect of its own.

3.—Chloride of ammonia, 2 parts; water, 200 parts.

4.—Burned alum,  $3\frac{1}{2}$  parts; water, 100 parts.

5.—Sulphate of ammonia, 30 parts; water, 50 parts.

6.—Common salt, 20 parts; water, 400 parts.

7.—Sodium carbonate,  $3\frac{1}{2}$  parts; water, 50 parts.

8.—Soda water glass, 45 parts.

These fluids are mixed together in the order quoted, and should the mixture appear milky or yellowish, a further 200 parts of water may be added. The solution is allowed to stand, the supernatant clear portion being used.

9.—The chemical department of the University of Virginia analyzed a popular hand grenade, and found that the vessel, holding about 600 c.c., contained a solution of the following: Sodium hyposulphite, 255.55 grams; sodium chloride,

## Waterproofing and Fireproofing

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48.12 grams; ammonium chloride, 12.60 grams; free ammonia, 12.24 grams.

10.—Another is said to be composed of ground marble, sulphuric acid and water. The acid and water are mixed in the proportion of 2 parts of acid to 6 parts of water, are put in the bottles, and then about 8 oz. of ground marble to each pint of the liquid put in, and the bottles instantly corked and tied down; when thrown into the fire the bottles are broken or burst by the heat, liberating the carbonic acid, and thus extinguishing the fire.

11.—A simple fire extinguisher may be made by any one at small cost, by dissolving 2 lb. of common salt and 10 lb. of ammonium chloride in 3 qt. of water and filling the solution into quart bottles of thin glass. This mixture has been found very suitable for extinguishing small fires. The bottles must be tightly corked and sealed, to prevent evaporation. At the breaking out of a fire the bottles are thrown into the flames, or their vicinity, and the extinction is effected by the contents of the breaking bottles.

12.—*Harden's Extinguishing Grenades.*—The solution contains 18.46% of chloride of sodium and 8.88% of chloride of ammonium.

13.—*Haycard's Extinguishing Grenades* consist of a watery solution which contains 15.7% of chloride of calcium and 5.6% of chloride of magnesium.

14.—*Haycard's Hand Grenades* are filled with a solution, which, in 100 parts, contains: Chloride of calcium, 18.4%; chloride of magnesium, 5.7%; chloride of sodium, 1.3%; bromide of potassium, 2.2% (?); chloride of barium, 0.3%; water, 72.2%.

15.—*Martin's Fire Protector.*—Glycerine, 2½ oz.; carbonate of ammonium, 4 dr.; chloride of ammonium, 10 dr.; boric acid, 10 dr.; bitartrate of potassium, 1 dr.; oxalate of potassium, 1 dr.

16.—*Munch Fire Annihilating Powder* consists of chloride of sodium, 43%; alum, 19.5%; sulphate of sodium, 5%; carbonate of sodium, 3.5%; silicate, 6.6%; water, 22.3%.

17.—*Schoenberg's Fire Annihilator* holds 15 oz. The solution contains 1.66% of carbonate of sodium and 6.43% of chloride of sodium.

### Liquid Fire Extinguishers.

One of the best agents—probably the best—is aqua ammonia, without any addition whatever. Next in order as an extinguisher comes carbonic acid gas. The

### (Fire Extinguishers)

following was patented in France several years ago, after numerous public exhibitions of the ability of the liquid to subdue fire.

1.—Make six solutions, as follows:

a.—Ammonium chloride, 200 parts; water, 20,000 parts.

b.—Alum, calcined and powdered, 350 parts; water, 10,000 parts.

c.—Ammonium sulphate, powdered, 3,000 parts; water, 5,000 parts.

d.—Sodium chloride, 2,000 parts; water, 40,000 parts.

e.—Sodium carbonate, 350 parts; water, 5,000 parts.

f.—Liquid water glass, 4,500 parts. Mix the solutions in the order named, and to the mixture, while still yellow and turbid, add 20,000 parts of water. Let stand, and when the precipitate has settled decant the clear liquid into thin blue glass containers, each holding from 3 pt. to ½ gal.

2.—Calcium chloride, 30 parts; magnesium chloride, 10 parts; water, 60 parts.

3.—Sodium chloride, 20 parts; ammonium chloride, 9 parts; water, 71 parts.

4.—Sodium carbonate, 16 parts; sodium chloride, 64 parts; water, 920 parts.

5.—Boric acid, 16 parts, by weight; alum, 24 parts; ferrous sulphate, 20 parts; dissolve in 160 parts of water. The solution is slowly poured into a cold solution of hyposulphite, 24 parts by weight; water glass, 40 parts; water, 640 parts.

6.—The now well-known extingueur introduced by Sinclair is a vessel filled with water charged with carbonic acid gas under great pressure.

7.—Foster, of Bolton, has introduced an extingueur in the form of a portable pump, which can draw a continuous water supply from any source, and saturate it with carbonic acid under pressure before emitting it in a jet.

8.—Common salt, 1 oz.; nitrate of soda, 1 oz.; sal ammoniac, 2 oz.; chloride of magnesium, 4 oz.; water, 20 oz. Dissolve.

9.—*Vienna Fire Extinguishing Agent.*—A solution of 5 parts of ferrous sulphate (coppers), 20 parts of ammonium sulphate and 125 parts of water.

### Petroleum or Benzine Flame.

Smother with a woolen cloth or carpet, or a wet muslin or linen cloth; or the flames may be extinguished by throwing on earth or sand.

### Powders and Pastes.

1.—Alum, 24%; ammonium sulphate, 52%; ferrous sulphate, 4%.

## Waterproofing and Fireproofing

### (Waterproofing)

2.—*Johnstone's*.—Make a mixture of equal parts of pyrolusite (manganese dioxide), potassium chlorate and potassium nitrate. Moisten with water glass, and press into a block. Place the block in a pasteboard box. Several boxes, connected by fuses, are suspended from the ceiling of a room.

3.—*Becher's* fire extinguishing powder contains 50 parts of saltpeter, 30 parts of sulphur, 4 parts of charcoal, and 1 part of oxide of iron. We fail to see the advantage of this peculiar sort of impure gunpowder as a fire extinguisher.

4.—One of the best solutions for the extinction of incipient fires consists of crude calcium chloride, 20 parts; salt, 5 parts; dissolved in water, 75 parts. Keep at hand, and apply with a hand pump.

5.—Common salt, 60%; sal ammoniac, 60%; sodium bicarbonate, 80%.

6.—Sal ammoniac, 100%; sodium sulphate, 60%; sodium bicarbonate, 40%.

7.—Carbonate of soda, 8 lb.; alum, 4 lb.; borax, 3 lb.; carbonate of potash, 1 lb.; silicate of soda solution, 24 lb.; are mixed together; 1½ lb. of this mixture is added to each gallon of water when required for use. The object is to cover everything with a fireproof film or deposit.

### WATERPROOFING

#### Awning or Apron.

1.—Dissolve 1 oz. of yellow soap in 1½ pt. of water by boiling; then stir in 1 qt. of boiled oil, and when cold add ¼ pt. of gold size.

2.—Awnings, Thick Blankets, etc.—Soak in a 7% solution of gelatine at 40° C., dry, pass through a 4% solution of alum, dry again, rinse in water, and dry.

#### Canvas.

1.—A solution containing equal parts by weight of gelatine and chrome alum. It is not advisable to mix more of the solution at once than is sufficient to give the canvas one coat, as if the mixture once sets it cannot be reliquified like a plain solution of gelatine, and hence, if the quantity of canvas to be waterproofed is small, it would, perhaps, be preferable to coat with plain gelatine solution until quite impervious to cold water, and then to thoroughly soak for, say, 24 hours, in a strong solution of chrome alum.

2.—The canvas is coated with a mixture of three solutions, as follows: (a) Gelatine, 50 grams; boiled in 3 l. of water free from lime. (b) Alum, 100 grams, dissolved in 3 l. of water. (c) Soda soap, dissolved in 2 l. of water.

### (Waterproofing)

3.—Sackcloth or canvas can be made as impervious to moisture as leather, by steeping it in a decoction of 1 lb. of oak bark with 14 lb. of boiling water. This quantity is sufficient for 8 yd. of stuff. The cloth has to soak for 24 hours, when it is taken out, passed through running water, and hung up to dry. The flax and hemp fibers, in absorbing the tannin, are at the same time better fitted to resist wear.

4.—The following is highly recommended as a simple and cheap process for coating canvas for wagon tops, tents, awnings, etc. It renders it impermeable to moisture, without making it stiff and likely to break. Soft soap is dissolved in hot water, and a solution of iron sulphate added. The sulphuric acid combines with the potash of the soap, and the iron oxide is precipitated with the fatty acid as insoluble iron soap. This is washed and dried, and mixed with linseed oil. The soap prevents the oil from getting hard and cracking, and at the same time water has no effect on it.

5.—Sodium carbonate, 1 lb.; caustic lime, ½ lb.; water, 2½ pt. Boil together, let it stand to settle, then draw off the clear lye and add to it 1 lb. of tallow, ½ lb. of rosin, previously melted together. Boil, and stir occasionally for half an hour; then introduce 3 oz. of glue, previously softened, 3 oz. of linseed oil, and continue the boiling and stirring for another half hour. In waterproofing, ½ oz. of this soap is mixed with 1 gal. of hot water, and in this the goods are soaked for about 24 hours, according to thickness and character. The pieces are allowed to drain until partly dried, then soaked for 6 hours or more in a solution prepared as follows: Aluminum sulphate, 1 lb.; lead acetate, ½ lb.; water, 8 gal. Shake together, allow to settle, and draw off the clear liquid. Wring out after rinsing, and dry at a temperature of 80° F.

6.—Boiled linseed oil, 3 gal.; spirits of turpentine, 3 pt.; patent driers, 3 oz.; powdered sulphur, ¼ oz.; yellow ochre or other pigment), q. s.

7.—Grind 96 lb. of English ochre with boiled oil, and add to it 16 lb. of black paint. Dissolve 1 lb. of yellow soap in 1 paiful of water, on the fire, and mix it, while hot, with the paint. Lay this composition, without wetting it, upon the canvas as stiff as conveniently can be done with the brush, so as to form a smooth surface; the next day, or the day after (if the latter, so much the better), lay on a second coat of ochre and black, with very little, if any, soap; allow this

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### (Waterproofing)

coat a day to dry, and then finish the canvas with black paint.

#### Carriage Covers, Waterproof Finish for.

Melt 6.35 parts of carnauba wax, dissolve in it 0.57 part of stearate of alumina, add 25.40 parts each of dark mineral oil and cotton oil and 6.35 parts of bone-black; stir well together, and add, when somewhat cooled, 25.40 parts of rosin spirit.

#### Coat, Waterproof.

Isinglass, alum, soap, equal parts; water, sufficient. Dissolve each separately, and mix the solutions, with which imbue the cloth on the wrong side. Dry, and brush the cloth well, first with a dry brush, and afterward (lightly) with a brush dipped in water.

#### Cotton, Linen, Jute and Hemp.

1.—Put into a bath of ammoniacal cupric sulphate of 10° B. at a temperature of 25° C.; let steep thoroughly, then put in a bath of caustic soda (20° B.), and dry. To increase the impermeability, a bath of sulphate of alumina may be substituted for the caustic soda.

2.—*Linen or Calico*.—a.—The Manner in Which Sea Fishermen do Coats and Leggings.—Whatever the article is, let it be stretched on a table. Make a very thick paint of whatever color is wished. An invisible green is, perhaps, as good as any. Take a large lump of common brown soap, pretty freshly cut from a bar, in the left hand, and every time you replenish the brush with paint rub well on the soap, and take up as much as possible, and rub well on one surface of the calico or linen. It will take long to do, and should be hung in the windiest place you can find. Summer is the best time, but a month will see it in very usable order, and you will have a supple and perfectly waterproof garment as paint can make. After wearing a few times, a second coat would be advisable, which will dry in half the time of the first, and must be done in the same way.

b.—A solution of alumina sulphate in 10 times its weight of water, and a soap bath of the following composition: 1 oz. of light-colored rosin and 1 oz. of crystallized soda are boiled in 10 oz. of water until dissolved. The rosin soap is precipitated with  $\frac{1}{2}$  oz. of table salt, and is subsequently dissolved along with 1 oz. of white curd soap in 30 oz. of hot water. It should be put in wooden tubs for use. On made-up articles, the two solutions

### (Waterproofing)

can be applied with a brush and then rinsed off.

#### Damp-proof Composition.

1.—Mineral naphtha, 20 gal.; mineral turps, 10 gal.; rosin, 112 lb.; dammar siftings, 28 lb. Run the rosin; when melted, take away from fire and add the turps and naphtha; dissolve the dammar siftings, and mix in. When thoroughly mixed, add 2½ gal. of boiled oil. Strain.

2.—*Buff*.—Use 1½ lb. of sulphide of zinc and  $\frac{1}{2}$  lb. of Oxford ochre to every gallon of spirit.

3.—*Drab*.—Use 1½ lb. of sulphate of zinc,  $\frac{1}{4}$  lb. of raw Turkey umber, and  $\frac{1}{2}$  lb. of Oxford ochre.

4.—*Green*.—Use 2 lb. of deep Brunswick green to 1 gal. of liquid.

5.—*Red*.—Use to every gallon of liquid 1½ lb. of Venetian red.

6.—*White*.—Use 1½ lb. of sulphide of zinc to every gallon.

#### Felt Hats.

1.—It is made of shellac dissolved in water by the aid of ammonia.

2.—The stuff of coarse hat bodies is imbued with drying oil, prepared by boiling 50 parts of linseed oil with 1 part each of white lead, litharge and umber; the felt to be dried in a stove, and then polished by pumice; 5 or 6 coats of oil are required; the surface is at last varnished. When the hat is intended to be stiff, the fabric is to be impregnated, first of all, with paste, then stove dried, cut into the desired shape, and pumiced repeatedly; lastly, placed in a hot iron mold and exposed to strong pressure.

3.—Remove lining of hat, and paint the inside with Canada balsam, made hot. Hats made waterproof, and not ventilated, will bring on premature baldness; so punch a few holes in the side.

4.—Boil 8 lb. of shellac, 3 lb. of frankincense and 1 lb. of borax in sufficient water.

#### Fishing Lines.

1.—Boiled oil, 2 parts; gold size, 1 part. Put in a bottle, shake well, and it is ready for use. Apply with a piece of flannel, expose to the air, and dry. After using the line 2 or 3 times it should have another coat, the application being repeated when necessary.

2.—Apply a mixture of 2 parts of boiled linseed oil and 1 part of good size; expose to the air, and dry.

#### Floors.

Flooring may be made impermeable by painting it with a solution of paraffine

## Waterproofing and Fireproofing

### (Waterproofing)

wax in kerosene. The coat lasts for 2 years. (See also *Wood*.)

#### Iron Pipes.

1.—*Coating for*.—Pitch, 112 lb.; coal tar, 160 lb.; creosote oil, 160 lb.; linseed oil, 112 lb.; rosin, 14 lb. Proportions of tar and creosote can be varied. Melt at 300° F., and dip in the iron pipes.

2.—*Composition for Preserving*.—Coal tar, 60 parts; pitch, 40 parts; linseed oil, 6 parts; rosin, 5 parts. Heat together to 300° F., and dip in the pipes.

#### Leather.

1.—Add to a boiling solution of common yellow soap, in water, a solution of alum or alum cake (alumina sulphate) as long as a separation of white alumina soap takes place; allow the precipitate to subside, wash it with hot water, heat moderately for some time to expel adhering water, and dissolve the semi-transparent mass in warm oil of turpentine. The solution may be applied by brush, or by dipping and rolling. Oil and colors may be added to the bath, and the substance dried in the air, or more rapidly in a drying-room at 90 to 100° F. (32 to 38° C.), with care to prevent fire.

2.—Best white or yellow wax, 100 oz.; Burgundy pitch, 6 oz.; ground-nut oil, 8 oz.; iron sulphate, 5 oz.; essence of thyme, 2 oz.

3.—A method of waterproofing leather and raw hides, used in Southern Austria, is as follows: Impregnate the substance with a gelatine solution, mixed with some mineral salt to coagulate the gelatine in the pores. The following mixture can be used: Water, 1,200 parts; gelatine, 15 parts; potash bichromate, 5 parts.

4.—Water, 1,500 parts; gelatine, 50 parts; potash bichromate, 30 parts. The temperature of the solution may vary from 53° F. (10° C.) to boiling point. When the bichromate percentage is small the liquor is used cold, and the leather or hide is immersed for 24 hours; as the proportion approaches the point of saturation the temperature must approximate more nearly to boiling, and the time of immersion be reduced until it becomes momentary. The bichromate solution may be replaced by the following: Water, 1,000 parts; gelatine, 10 parts; lead acetate, 100 parts; alum, 100 parts. In every case, after impregnation on one or both sides, the leather or hide should be dried, and dressed on both sides with paraffine.

### (Waterproofing)

#### Oil, Waterproofing.

1.—The manner of making oilcloth or oilskin was at one period a mystery. The process is now well understood, and is equally simple and useful. Dissolve some good rosin or lac over the fire in drying linseed oil, till the rosin is dissolved, and the oil brought to the thickness of a balsam. If this be spread upon canvas or any other linen cloth, so as fully to drench and entirely glaze it over, the cloth, if then suffered to dry thoroughly, will be quite impenetrable to wet of every description. This varnish may either be worked by itself or with some color added to it; as verdigris for a green, umber for a hair color, white lead and lamblack for a gray, indigo and white for a light blue, etc. To give the color you have only to grind it with the last coat of varnish you lay on. You must be as careful as possible to lay on the varnish equally in all parts.

2.—A better method, however, of preparing oilcloth is first to cover the cloth or canvas with a liquid paste, made with drying oil in the following manner: Take Spanish white or pipeclay which has been completely cleaned by washing and sifting it from all impurities, and mix it up with boiled oil to which a drying quality has been given by adding a dose of litharge, one-quarter the weight of the oil. This mixture, being brought to the consistency of thin paste, is spread over the cloth or canvas by means of an iron spatula, equal in length to the breadth of the cloth. When the first coating is dry a second is applied. The roughness occasioned by the coarseness of the cloth or the unequal application of the paste are smoothed down with pumice, reduced to powder, and rubbed over the cloth with a bit of soft serge or cork dipped in water. When the last coating is dry the cloth must be well washed in water to clean it, and after it is dried a varnish composed of lac dissolved in linseed oil boiled with turpentine is applied to it, and the process is complete. The color of the varnished cloth thus produced is yellow, but different tints can be given to it in the manner already pointed out. An improved description of this article, intended for printed and figured varnished cloths, is obtained by using a finer paste and cloth of a more delicate texture.

3.—Dissolve 1 oz. of beeswax in 1 pt. of the best boiled linseed oil, over a gentle fire, applying when cold, with a piece of rag, rubbing it well in, and afterward

## Waterproofing and Fireproofing

### (Waterproofing)

hanging up to dry, which will take 4 or 5 days.

4.—Paint with boiled linseed oil, colored to suit. It must be done in a very hot room or in a bright sunlight. A shoebrush is the best for applying it. A little patent drier may be added. It is said that the Chinese use a mixture of 1 oz. each of beeswax and soft soap with the oil, which is then boiled down. If the surface seems tacky, varnish with shellac varnish. In any case, apply the oil as thin as possible, and let it dry perfectly between successive coats.

### Oilcloth.

Take 20 oz. of lard oil, 10 oz. of paraffine, 1 oz. of beeswax; heat the oil over a slow fire, and when hot add the paraffine and wax; allow the whole to remain over the fire until the latter articles are melted, and add a few drops of sassafras oil or other essential oil to preserve it.

### Oilskins, Seamen's.

The material should be fine twilled calico, dipped in bullock's blood, and well dried in a current of air; then 2 or 3 coats of raw linseed oil, with a little gold size, or litharge in it (say 1 oz. to 1 pt. of oil). Each coat should be allowed to dry thoroughly before the next is put on (as before in a current of air, care being taken to shelter it from both sun and rain). Oilskins made in this way, both here and in the tropics, have stood for years.

### Paper.

1.—It is a well-known fact that cellulose is soluble in cuprous ammonia solution; paper, linen, and other vegetable tissues, laid therein, undergo a sort of surface amalgamation of the fibers, which alters their absorbent powers. A sheet of paper so treated, and dried afterward, becomes impermeable to water, and this property is not effaced by subsequent boiling. Sheets of paper soaked in the solution, and laid one upon the other, and rolled, become amalgamated into a kind of cardboard, possessing great elasticity and cohesive power. The cuprous solution may be prepared by agitating copper filings in a closed vessel containing liquid ammonia of 0.88 sp. gr.

2.—Dissolve 8 oz. of alum and 3¾ oz. of Castile soap in 4 pt. of water, and 2 oz. of gum arabic and 4 oz. of glue, separately, in 4 pt. of water; mix the solutions, heat slightly, dip in the single sheets, and hang up until dry.

3.—Take pale shellac, 5 oz.; borax, 1

### (Waterproofing)

oz.; water, 1 pt. Digest at nearly the boiling point till dissolved, then strain. This forms also an excellent vehicle for water colors, inks, etc. If required quite transparent, the lac should be bleached as follows: Dissolve shellac in a lye of pearlsh, by boiling; filter, and pass an excess of chlorine gas through the solution, which will precipitate the white lac. Wash and dry the precipitate, and cast it, if desired, into sticks.

4.—Treat the tissue to be waterproofed with chloride, sulphate, or other soluble salt or salts of zinc or cadmium, in conjunction with ammonia, applied in the form of a solution composed of about 3 parts of crystallized zinc sulphate or 3 parts of a solution of zinc chloride at 96° Tw. (47° B.), and about 2 parts of a solution of ammonia of sp. gr. 0.875. The paper which it is proposed to treat is passed through a cistern lined with lead, and specially constructed for this purpose, with an arrangement of rollers, so as to allow the material to pass through at a speed varying from 30 to 36 yards per minute, according to the thickness. In its passage through the liquor the material becomes perfectly saturated. From the bath it passes through a pair of squeezing rollers, which remove the superfluous liquor, and harden it by compression. From the rollers it is next passed to a suspending apparatus, then hung along the room in folds, in a temperature of 110° F. (43° C.), until it is sufficiently dry to be taken down. The rollers in the cistern, the squeezing rollers, and the suspending apparatus are so speeded that the material is taken from one to the other without any inconvenience or stoppage.

5.—Treat with glue, gelatine, or other similar substances, in conjunction with bichromate or chromate of potash, soda or alumina, applied in the form of a solution of about 1 part of glue or gelatine in about 8 parts of water at 160° F. (71° C.) and a solution of 1 part of potash bichromate in 15 parts of water. The mode of treatment in this case differs from 4 only in two points: (a) During the time the material is traversing the bath, as already described, the solution is maintained at 160° F. (71° C.) by means of siphon pipes charged with steam. (b) Instead of suspending to dry, the material is immediately passed over three steam cylinders 7 ft. in diameter, carrying a pressure of 15 to 20 lb. to the square inch. The cylinders are provided with gauges to indicate the pressure they are required to carry, and also with safe-



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### (Waterproofing)

ty valves to prevent this pressure from being exceeded. The bath must always be kept in a state of darkness.

6.—The paper is treated with acetate, sulphate or chloride of alumina, applied in the form of a solution of 1 part of any of these compounds in 6 parts of water at 160° F. (71° C.). The same conditions are required to produce a waterproof material with these compounds as those described in 4 and 5, with this difference, that it is not absolutely necessary to preserve darkness during the process.

7.—Mix 28 parts of ordinary olive oil, 28 parts of rape-seed oil and 28 parts of linseed oil, and add to the mixture a solution of 8 parts of wax in 8 parts of oil of turpentine. This mixture is applied on the paper on one side or both sides, by hand or in machine. The paper thus prepared is said to remain waterproof longer than the waterproof paper now in the market.

8.—*Packing Paper.*—a.—Dissolve 1½ lb. of white soap in 1 qt. of water. In another quart of water dissolve 1½ oz. of gum arabic and 5 oz. of glue. Mix the two solutions, warm them, soak the paper in the liquid, and pass it between rollers, or simply hang up to dry.

b.—Packing paper may be made watertight by dissolving 1.8 lb. of white soap in 1 qt. of water, and in another quart 1.8 oz. of gum arabic and 5.5 oz. of glue. The paper is soaked in the mixture and hung up to dry.

9.—*Parchment Paper.*—a.—To Render Paper Impervious to Grease and Water.—Parchment paper is plunged into a warm solution of concentrated gelatine to which has been added 2½ to 3% of glycerine, and allowed to dry. The resulting paper is impervious to grease. If desired to make a paper waterproof, the same parchment paper is dipped in carbon bisulphide containing 1% of linseed oil and 4% of india rubber.

b.—Thoroughly wash woolen or cotton fabrics, so as to remove gum, starch, and other foreign bodies; then immerse them in a bath containing a small quantity of paper pulp. The latter is made to penetrate the fabric by being passed between rollers. Thus prepared, it is afterward dipped into sulphuric acid of suitable concentration, and then repeatedly washed in a bath of aqueous ammonia until every trace of acid has been removed. Finally, it is pressed between rollers to remove the excess of liquid, dried between two other rollers which are covered with felt, and lastly, calendered.

10.—*Roofing.*—Old newspapers may be

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converted into waterproof roofing material by applying coats of hot coal tar with a brush, uniting two or more thicknesses.

#### Roofs.

*Paint for Roofing Paper.*—1.—Dissolve rosin in a hot mixture of a fat oil and coal tar, then add to this an intimate mixture of sulphide of barium and sulphide of zinc, and coat the roof to be protected with the mixture.

2.—According to Roedelius, 25 parts of distilled coal tar, 18 parts of distilled pine tar, 15 parts of silicic acid, 10 parts of magnesia, 6 parts of linseed oil, 6 parts of anthracene oil, 8 parts of oxide of iron, 8 parts of oxide of lead and 4 parts of silicate of soda must be intimately mixed at about 212° F., until a uniform mass is obtained. The mass, thinly applied, is transformed, within 12 hours, into a plastic cement, of gutta percha-like consistency, that is, in an extraordinary degree, weatherproof.

*Roof Stopping.*—1.—Rest.—Common rosin, 56 lb.; paraffine wax, 20 lb.; calcined flint, 50 lb.; raw linseed oil, 3 gal.; red lead, 3 lb.; wood tar, 3 lb.; slaked lime, 3 lb. Boil the oil with the red lead, melt in the rosin and the wax. Heat the tar and lime together, add to the oil mixture, then add the calcined flint, and thoroughly mix.

2.—Black "American Roof Paint."—To any quantity of coal tar add as much lime water as it will stand; it is then ready for use. If required with a luster surface, add a small quantity of a good Brunswick black.

3.—Brown "American Roof Paint."—Proceed as for black, adding strong Venetian red to shade required.

4.—Dark.—Common rosin, 42 lb.; raw linseed oil, 2½ gal.; stout terebine, ¼ gal.; paraffine wax 4 lb.; powdered slate, 14 lb.; gas tar, 14 lb. Melt the rosin and wax together, and stir in the oil and terebine; then add the powdered slate and gas tar, and thoroughly stir. For stopping roofs, melt in a ladle, and pour along the cracks, and run well in with a plumber's soldering iron. For walls, melt, and mix with some of the material of the wall—stone or brick, as the case may be—crushed very fine, and applied hot, as putty. When cold, scrape off the superfluous material. This is very useful for mending slate roofs and cisterns, and lead roofs, gutters, parapets, balconies, window sills, etc., and also as a damp course. Absolutely impervious to water, and is not affected by solar heat or the most

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### (Waterproofing)

intense frost; it forms a perfect cure for leaky roofs.

5.—Elastic Roof Paint.—Gum shellac, 7 lb.; soda crystals, 1 lb.; water, 12 gal. Place in a pan over a fire; keep at a good heat, but do not boil; when all is dissolved—should be in from 1 to 2 hours—remove, and keep in cans, tightly corked. To use, add 1 gal. of above to 1 gal. of ordinary paint. It will not interfere with consistency or covering power of the paint. Is weatherproof, and suitable for both wood and metal.

6.—Light.—Common rosin, 42 lb.; raw linseed oil,  $2\frac{1}{2}$  gal.; stout terebine,  $\frac{1}{4}$  gal.; paraffine wax, 14 lb.; powdered limestone, 28 lb.

### Sailcloth. (See also Awnings; Canvas.)

1.—Sailcloth, allowed to lie about in a wet condition, or rolled up wet, will begin to rot, and the spots cannot afterward altogether be removed by washing, and not even by chlorine. If dried in the stretched condition, the cloth will not spoil. This can be done on a fully manned boat, but not always on other craft. Soap and brush, applied at once, will do some good. There is also a mistaken idea that rinsing with fresh water, and drying in the sun, will prevent mischief. To avoid all trouble, the sailcloth should be impregnated. The weaver's glue has first to be removed, which is accomplished by boiling a roll of about 6 pieces in malt, or also in caustic soda. In the latter case, every packet must have a fresh lye, but the subsequent washing in dilute hydrochloric acid does not call for a renewal of the bath every time. The cloth is dried hanging, as in all subsequent operations; there is more shrinkage on a cylinder. For impregnation, a solution of alum and phenylate of lime is recommended. The impregnated cloth passes between two rolls, the upper of metal, the lower of paper. Finally, comes the fixing with soda silicate.

2.—First prepare a zinc soap by completely dissolving 56 parts of soft soap in 125 to 150 parts of water, and adding 28 to 33 parts of zinc vitriol to the boiling liquid, stirring constantly. The zinc soap will float on the surface, and form, when cold, a hard white mass, which must be removed, and redissolved in fresh boiling water to free it from any alkaline sulphates. Then pour 233.5 parts of crude linseed oil (free from s'time) into a boiler with 2.5 parts of best potash and 5 parts of water. Boil the mass till it becomes white and opaque, forming a fluid soap compound. Add 1.25 parts of sugar of

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lead, 1 part of litharge, 2 parts of red lead and 10.5 parts of brown rosin. Boil the whole for about an hour, taking care that the temperature does not exceed 100° C. (212° F.), and stir thoroughly from time to time. Now add 15 parts of the zinc soap, and stir till the metallic soap has combined with the oil; here also the temperature must not be raised above 100° C. When the ingredients are thoroughly mixed add a solution of 1.5 parts of india-rubber in 8.56 parts of turpentine oil, and stir till it has thoroughly combined with the mass. Coat one side of the cloth with this compound, which should be 70° C. (158° F.) hot, by means of a brush. Hang the article up to dry, and then apply a second coat of the compound at the same temperature, again allowing it to dry. The fibers will now be completely saturated, and the fabric rendered waterproof.

### Silk, Varnished.

This material, often employed for umbrellas, is prepared with a paste composed of linseed oil, boiled with  $\frac{1}{4}$  part of litharge, 16 parts of dried and sifted pipe-clay, 3 parts of litharge very finely ground, dried and sifted, and 1 part of lampblack. After washing the silk, fat copal varnish is applied instead of that used for oilcloth.

### Stone Preserving Compositions: Damp-proof Compositions Made by Varnish Processes.

*Special Gum Compound for Use in the Stone Liquids.*—Raw linseed oil, 6 gal.; india-rubber, 6 lb.; common rosin, 6 lb.; paraffine wax, 56 lb. Dissolve the rubber in the oil by gentle heat, and with continual stirring. When the rubber is dissolved melt the rosin, and stir in. Break up the wax and stir well in. When all is thoroughly mixed, strain through a coarse sieve while hot. The heat during this process should not be excessive, or the rubber loses some of its elastic qualities. It facilitates the manufacture of this compound if it is made a rule to have a stock of rubber cut up and soaked in linseed oil, always ready. It will then readily melt at 212° F.

*Black Compo.*—(Not used alone, but employed in other preparations). Black rosin, 68 lb.; rosin oil, 18 gal. Boil together till the rosin is dissolved; strain while hot in tank.

*Brick Red.*—Thinning liquid, 10 gal.; dry zinc white, 2 lb.; powdered Spanish brown, 5 lb. With these stone liquid compounds it is possible to preserve a

## Waterproofing and Fireproofing

### (Waterproofing)

stone front without altering its appearance, or it can be renovated to appear new without any glossy or painted look, its stony aspect not being altered by the liquid after it is dried in, so that it can be used when paint is entirely out of the question. Before applying the liquid, dirty surfaces should be brushed clean with wire brushes.

**Textiles.** (See also **Awnings; Canvas; Sailcloth; Silk.**)

1.—*Lourey's Process.*—Soap, 2 oz.; glue, 4 oz.; water, 1 gal. Soften the glue in cold water, and dissolve it, together with the soap, in the water, by aid of heat and agitation. The cloth is filled with this solution by boiling it in the liquid for several hours, the time required depending upon the kind of fiber and thickness of the cloth. When properly saturated, the excess of liquid is wrung out, the cloth is exposed to the air until nearly dry, then digested for 5 to 12 hours in the following solution: Alum, 13 oz.; salt, 15 oz.; water, 1 gal. It is finally wrung out, rinsed in clean water, and dried at a temperature of about 80° F. (27° C.).

2.—*Paut's Process.*—Requires a small quantity of oil, but in other respects resembles the last. It is given as follows: Sodium carbonate, 1 lb.; caustic lime,  $\frac{1}{2}$  lb.; water, 2 $\frac{1}{2}$  pt. Boil together, let it stand to settle, then draw off the clear lye, and add to it 1 lb. of tallow,  $\frac{1}{2}$  lb. of rosin, previously melted together. Boil, and stir occasionally, for half an hour; then introduce 3 oz. of glue (previously softened), 3 oz. of linseed oil, and continue the boiling and stirring for another half hour. In waterproofing,  $\frac{1}{2}$  oz. of this soap is mixed with 1 gal. of hot water, and in this the goods are soaked for about 24 hours, according to thickness and character. The pieces are allowed to drain until partly dried, then soaked for 6 hours or more in a solution prepared as follows: Aluminum sulphate, 1 lb.; lead acetate,  $\frac{1}{2}$  lb.; water, 8 gal. Shake together, allow to settle, and draw off the clear liquid. Wring out after rinsing, and dry at a temperature of 80° F. (27° C.).

3.—*Reimann's Process.*—The cloth is passed slowly, by machinery, through a tank divided into 3 compartments, the first containing a warm solution of alum, the second a warm solution of lead acetate, and the third pure water, which is constantly renewed. The cloth, on passing from the latter, is brushed, and beaten to remove the salt adhering to the surface,

### (Waterproofing)

and finally hot-pressed and brushed. In this case, lead sulphate is deposited in the fibers.

4.—*Townsend's Process.*—Two solutions are used, as follows: Dextrine, 20 lb.; white soap, 10 lb.; water, 16 gal. The solution is boiled for some minutes, and if color is required, 1 pt. of logwood liquor is added. The second solution consists of a saturated solution of alum in water, or 6 lb. of zinc sulphate and 9 gal. of water.

5.—*Bullard's Process.*—Somewhat similar to Reimann's. In this, strong aqueous solutions of aluminum sulphate and lead acetate are used alternately.

6.—Coating the under side of the cloth with a solution of isinglass, and then applying an infusion of galls, is another method, a compound being thus formed which is a variety of leather.

7.—Another and easier method is the formation of aluminum stearate in the fiber of the cloth, which may readily be done by immersing it in a solution of aluminum sulphate in water (1 in 10), and, without allowing it to dry, passing through a solution of soap made from soda and tallow, or similar fat, in hot water. Reaction between the aluminum sulphate and the soap produces aluminum stearate and sodium sulphate. The former is insoluble, and remains in the fiber; the latter is removed by subsequently rinsing the fabric in water.

8.—Acetate of lead, 16 av.oz.; tannin, 2 av.oz.; sulphate of soda, 1 av.oz.; alum, 10 av.oz.; water, 1 gal. Dissolve the alum and soda salt in half the water, and the lead salt in the other half, mix the solutions, let stand overnight, decant the clear liquid, and in this dissolve the tannin; filter through paper, and add enough water to make the whole measure 1 gal.

### Umbrellas.

First sponge the cloth on both sides with a solution of 1 part of sulphate of alumina in 10 parts of water, then with a solution of soap, which is prepared by boiling 1 part of light-colored rosin and 1 part of crystallized carbonate of soda with 10 parts of water until the rosin is dissolved. The rosin soap thus formed is to be separated by the addition of common salt. This soap is then dissolved, together with 1 part of soda soap, by boiling in 30 parts of water. After this last sponging, rinse in the rain.

### Wallpaper, To Render Washable.

1.—Wallpapers that are exposed to many vapors or smoke, and are liable to

## Waterproofing and Fireproofing

### (Waterproofing)

become soiled or black, may, according to Für's Haus, be easily rendered washable, either before or after they are hung, by preparing them in the following manner: Dissolve 2 parts of borax and 2 parts of shellac in 24 parts of water, and strain through a fine cloth. With a brush or a sponge apply this to the surface of the paper, and when it is dry polish it to a high gloss with a soft brush. Thus treated, the paper may be washed without fear of removing the colors or even smearing or blurring them. It may be treated on or off the walls.

2.—The following coating has proved very effective in preventing the penetration of moisture on the weather side of walls: Pitch, 50 lb.; rosin, 30 lb.; red ochre, 6 lb.; fine brick dust, 12 lb.; all boiled together, with constant stirring, and then sufficient oil of turpentine—about one-quarter of the volume of the above—added, to cause it to spread rapidly. It should be laid on as thin as possible, with a bristle brush.

### Wood.

1.—In order to render wood waterproof and fireproof, the following "silicification" process is made use of: The small boards are first laid into a water glass solution of 5 to 10° B., where they are left 10 to 12 hours, when they are taken out and allowed to drip off. After drying they are placed in a solution (gravity 2 to 3° B.) of calcium chloride, magnesium chloride and ammonium chloride. In this they are left 4 to 6 hours, and after dripping off and drying again they are ready for use.

2.—Dry the wood, and saturate with hot paraffine oil or melted paraffine.

### (Waterproofing)

### Wooden Dishes, Water-tight Preparation for.

1.—Common brown rosin,  $\frac{1}{2}$  lb.; bees-wax, 2 oz. Melt together in a tin pan (preserved meat tin will do); when quite fluid, run solution rapidly all over where required. Wood must be perfectly dry and warm.

2.—Soak  $\frac{1}{2}$  lb. of best glue in cold water until quite soft; melt in the glue kettle. When quite dissolved, pour in 1 oz. of hot saturated solution of bichromate of potash, and stir well. It is now ready for use; apply with a brush. Put the article so treated to dry in full daylight for a day or two, and then apply strong alum solution. The vessel is now ready for use, but must be washed first.

### Woolen Cloth.

1.—Powdered alum, 4 oz.; sugar of lead,  $4\frac{1}{2}$  oz.; dissolved in 3 gal. of water, stirred twice a day for 2 days. When perfect subsidence has taken place, pour off the clear liquid only, and add to it 2 dr. of isinglass, previously dissolved in warm water, taking care to mix thoroughly. Steep the garments in this mixture for 6 hours, after which hang up to drain and dry. Wringing must be avoided. This recipe is used by woolen cloth waterproofers.

2.—Boil  $4\frac{1}{2}$  oz. of white soap in  $2\frac{1}{2}$  gal. of water, and separately dissolve  $5\frac{3}{4}$  oz. of alum in  $2\frac{1}{2}$  gal. of water. Heat the two solutions to 190° F. (88° C.), pass the fabric first through the soap bath and then through the alum, and finally dry in the open air.



## CHAPTER XXVII

### WRITING MATERIALS

#### WRITING MATERIALS

**Bags.** (See Marking Inks.)

#### Blotting Paper.

1.—*Blotting Block.*—Steep 50 parts of wool fibers in 1,000 parts of water in which 4 parts of soda have been dissolved; in addition, mix 945 parts of calcined plaster with 1 part of tartaric acid, and add the powder to the soda solution. The carbonic acid set free aerates the plaster paste, forming a very porous mass, which very readily absorbs ink and other fluids.

2.—*Chemical Blotting Pad.*—A cheap and excellent substitute for blotting paper may be extemporized as follows: Mix 14 parts, by weight, of gypsum and 2 parts of potato flour with sufficient water to produce a plastic paste. Pour or press into a suitable mold. As soon as the mass has become hard and dry it affords an admirable blotter.

3.—*Substitute.*—A cheap and excellent substitute for blotting paper may be extemporized as follows: Mix 14 parts, by weight, of plaster of paris and 2 parts of potato flour with sufficient water to produce a plastic paste. Pour or press into a suitable mold, and as soon as the mass becomes hard and dry it affords an admirable blotter.

#### Crayons.

*Indelible Oil Crayon.*—The nearest approach to preparations of this kind that we know of are the pencils made at the Faber Pencil Works in Germany, for sketching on glass, porcelain, etc.

**Black.**—Lampblack, 10 parts; white wax, 40 parts; tallow, 10 parts.

**Dark Blue.**—Prussian blue, 15 parts; gum arabic, 5 parts; tallow, 10 parts.

**Light Blue.**—Prussian blue, 10 parts; white wax, 20 parts; tallow, 10 parts.

**White.**—Zinc white, 40 parts; white wax, 20 parts; tallow, 10 parts.

**Yellow.**—Chrome yellow, 10 parts; wax, 20 parts; tallow, 10 parts.

The colors are mixed with the fats in warmed vessels, levigated with the same, and are then allowed to cool until they have acquired the proper consistency for being transferred to the presses. In these the mass is treated and shaped, similarly as the graphite in the presses, for ordinary pencils.

#### HEKTOGRAPH

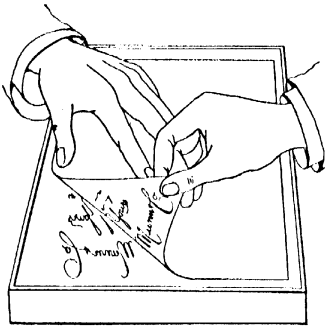
1.—The hektograph, or copying pad, is very useful in copying writing or drawings when only a limited number of copies is required. A practical hektograph may be prepared according to the following directions: Soak 1 oz. of Cooper's gelatine overnight in enough cold water to cover it well, taking care that all the gelatine is swelled. Prepare a salt water bath by dissolving 2 oz. of common salt in 1 pt. of water. Heat 6 or 7 oz. of pure glycerine over the salt water bath to a temperature of 200° F. Pour off from the gelatine all the water remaining unabsorbed, and add the gelatine to the hot glycerine. Continue the heating for an hour, carefully stirring the mixture occasionally, avoiding as much as possible the formation of bubbles or froth. Finally, add 20 drops of oil of cloves to prevent decomposition. The composition is now ready for pouring into the vessel designed to hold it while in use. This vessel may be made especially for the purpose, or a shallow cake tin may be used. After the tin is filled with the composition it must be placed in a level position, in a cool place, free from dust, and allowed to remain for at least 5 hours. To prepare the pad for use it is necessary to pass a wet sponge lightly over the face of the gelatine and allow it to nearly dry before taking the first copy. If this precaution is neglected the face of the pad will be ruined by the first transfer. The writing or drawing to be copied must be made with hektograph ink, using a new steel pen. (For ink, see Inks, Hektograph.) After the writing be-

Always consult the Index when using this book.

## Writing Materials

### (Hektograph)

comes dry it is placed face down on the pad and rubbed gently on the back to insure the perfect contact of every part. After remaining on the pad for about a minute, remove the original and proceed to take the copies by placing the paper on the pad and removing it therefrom,



Hektograph

always beginning at the corner, as shown in the engraving. After taking the desired number of copies, or when the impression is exhausted, the pad is to be washed lightly with a sponge wet in cold water. The pad is then allowed to dry before being used again. The washing is unnecessary when the pad is left unused for 2 or 3 days, as the ink will be absorbed so as not to interfere with making a new transfer. The pad unavoidably wastes away in use. If its surface should become uneven, or should it be injured in any way, it can be restored by reheating it over the salt water bath and allowing it to cool as before described. Failure in making the hektograph results from either of the following causes: Inattention to the instructions; insufficient heating of the composition; the use of too much glycerine, which prevents gelatinization. The obvious remedy for the last difficulty is to use less glycerine or more gelatine. No. 2 (kaolin formula) is recommended, as the composition gelatinizes quickly.

2.—Gelatine, 100 parts; water, 375 parts; glycerine, 375 parts; kaolin, 50 parts.

3.—Gelatine, 100 parts; dextrine, 100 parts; glycerine, 1,000 parts; barium sulphate, 9, 8.

4.—Good ordinary glue, 100 parts; glyc-

### (Inks)

erine, 50 parts; finely powdered barium sulphate, 25 parts; water, 375 parts.

5.—Glue, 100 parts; glycerine, 500 parts; finely powdered kaolin or barium sulphate, 25 parts; water, 375 parts. For ink, a concentrated solution of Paris violet is recommended. To remove old copy from pad, a little muriatic acid is added to the water.

6.—For a tin dish, 7 x 11 in.: Glue, 3 oz.; glycerine, 15 oz.; kaolin,  $\frac{3}{4}$  oz.; water,  $11\frac{1}{4}$  oz.

7.—Soak 2 parts of best glue or gelatine in cold water overnight. Pour off the excess of water. Warm the glue in a water bath, and add 20 to 24 parts of glycerine, 8 to 12 parts of finely ground heavy spar or barytes, 2 parts of dextrine. Mix thoroughly, stirring constantly. Pour the melted mixture in a shallow pan, and allow it to cool. Less glycerine should be used in warm weather.

### INKS

The following collection of ink recipes is very large, and only those have been selected which were believed to be trustworthy. Ink recipes are noted for their unreliability, but the following were selected principally from periodical literature, and many are translated for the first time. The manufacture of writing ink is one of the most promising of the small industries. There are few chemical preparations the use of which has become so general as that of writing ink, and yet it is rare to find an ink that fulfills all the conditions required of it. This is explainable upon the ground that ink recipes are not constructed according to any chemical formula, but that we are compelled to rely upon empirical experiments, and make use of the results gathered by practical experience. A good black ink must flow easily from the pen, and must yield either immediately or in a short time a deep black writing. It must not corrode metallic pens, nor destroy the paper. Further than this, a good ink should contain no considerable sediment when kept in airtight bottles. In ordinary ink bottles a sediment will always form, and the more it is exposed to the atmosphere the faster it will form. An ink that is to be used for important documents must not be washed out with water or absolute alcohol so as to be permanently illegible. Ink may consist of either a clear solution of any dyestuff, or, as in the case of common black ink, a finely divided, insoluble precipitate suspended in water. The chief materials

## Writing Materials

### (Inks)

used for making this ink are gallnuts, green vitriol and gum, which are employed in the most varied proportions. The gallnuts are crushed to a coarse powder and boiled in water, or, better, digested for several hours at a temperature near the boiling point, and the gum and green vitriol added to the filtered decoction in solution. The so-called alizarine inks flow easily from the pen, but they mostly suffer from the fact that the writing appears at first only of a faint greenish, bluish or reddish color, although it gets darker afterward. The most permanent writing is done with India ink, because the black coloring matter of this ink consists of finely divided carbon, which is unaffected by chemical reagents. Its high price seldom permits of its use.

### Aniline Inks.

Many of the aniline dyes now manufactured produce good inks, particularly copying and hektograph inks, and serve well where no special permanence is required. They become bleached from the action of air and light. Water containing lime is apt to decompose many aniline colors, hence only distilled water should be used in the manufacture of these inks.

1.—*Black*.—a.—Water-soluble nigrosine, 200 gr.; potassium bichromate, 30 gr.; gelatine, 30 gr.; water, 1 pt. Dissolve the dye and the gelatine in about 12 fl.oz. of water, with the aid of gentle heat, and add the bichromate, dissolved in the remainder of the water. Keep in the dark.

b.—Methyl violet, 6 grams; Bengal green, 10 grams; Bismarck brown, 4 grams; acacia, 60 grams; water, 8 fl.oz.

2.—*Blue*.—Resorcin blue, M, 48 gr.; sugar, 192 gr.; oxalic acid, 10 gr.; distilled water, 19¼ fl.oz. Mix the dye with 1 fl.oz. of cold water, set aside for 2 hours, then add the remainder of the water, in the hot state, and the other ingredients, and stir until dissolved. Any other water-soluble blue may be used—phenyl blue, methylene blue, etc.

3.—*Red*.—Eosine, 144 gr.; sugar, 288 gr.; distilled water, 20 fl.oz. Mix the dye with 1 fl.oz. of cold water, set aside for 2 hours, add the remainder of the water, hot, and the sugar, and stir until dissolved.

### Autographic Ink.

1.—White soap, 100 parts; white wax, 100 parts; mutton suet, 30 parts; shellac, 50 parts; mastic, 50 parts; lampblack, 30 or 35 parts.

### (Inks)

2.—Use a saturated solution of alum with coloring matter in it, as indigo.

### Black Inks.

1.—Tannic acid, 1 oz.; pyrogallie acid, ½ dr.; lactate of iron, 1 oz.; sulphate of iron, 1 oz.; pyoktannin, ½ dr.; tartaric acid, 1 oz.; warm water, 6 pt. Shake well, to dissolve. Set aside for a few days, shaking occasionally. Strain through cotton wool, and add 1½ oz. of fresh mucilage. This ink writes a deep black, and gives good copies, it is said.

2.—An exceedingly fine ink is said to be produced by the following recipe: Galls, 11 parts; green vitriol, 2 parts; indigo solution, 1-7 part; water, 33 parts. Here the relatively larger quantity makes the gum unnecessary, while the indigo solution makes the brilliant black seem still deeper. Writing executed with this ink may, it is true, be removed by means of dilute acids, but it may be rendered visible by chemical means.

3.—French extract of campeachy wood, 100 parts; lime water, 800 parts; phenol (carbolic acid), 3 parts; hydrochloric acid, 25 parts; gum arabic, 30 parts; red chromate of potash, 3 parts. The extract is first dissolved in the lime water, on a steam bath, with frequent stirring or shaking, after which the carbolic and hydrochloric acids are added, and change the red color to a brownish yellow. It is then heated half an hour on a steam bath and set aside to cool. It is next filtered, and the gum and bichromate, dissolved in water, are added. Enough water is then added to make up the solution to 1,800 parts. This ink is a true red when used, but soon gets black.

4.—Bruised galls, 2 lb., digested in 2 qt. of alcohol at a temperature of 101 to 140° F. (40 to 60° C.); when about half the alcohol has evaporated add 3 qt. of water; stir well, and strain through a linen cloth. To clarify the solution, add 8 oz. of glycerine, 8 oz. of gum arabic and 1 lb. of sulphate of iron, dissolved in water. Stir thoroughly from time to time, for a few days, allow to settle, and put in well stoppered bottles for preservation. The addition of too much sulphate of iron is to be avoided, as causing the ink soon to turn yellow. Ink thus prepared is said to resist the action of light and air for at least 12 months without suffering any change of color.

5.—Digest in an open vessel 12 oz. of coarsely powdered galls, 15 oz. of gum senegal, 18 oz. of sulphate of iron, 3 dr. aqua ammoniac, 24 oz. of alcohol and 18 qt. of distilled or rain water. Continue



## (Inks)

the digestion till the fluid has assumed a deep black color.

6.—To good gall ink add a strong solution of fine Prussian blue in distilled water; the ink writes greenish blue, but afterward turns black. It is said that it cannot be erased either by acids or alkalis without the destruction of the paper.

### Blue-Black Ink.

1.—Aleppo nutgalls "blue,"  $4\frac{1}{2}$  oz.; bruised cloves,  $\frac{1}{4}$  oz.; cold water, 40 oz.; ferrous sulphate (purified crystals),  $1\frac{1}{2}$  oz.; sulphuric acid, 35 drops; sulphate of indigo,  $\frac{1}{4}$  oz. Macerate the nutgalls and cloves in the water during a fortnight, then press and strain through a cloth filter; add the ferrous sulphate, previously powdered, dissolve, and add the acid and indigo solution. Shake or stir the mixture well, then set it aside for a week, and filter it. The nutgalls should be free from insect perforations. The sulphate of indigo should be used in the form of a thinish paste, neutral, or nearly so.

2.—Bruised galls, 3 oz.; iron sulphate, 1 oz.; gum arabic, 1 oz.; vinegar, 1 oz.; water, enough to make 24 oz.; indigo carmine, enough to give a blue tint. Macerate, with frequent shaking, for 14 days, and then decant. Permanent blue-black ink.

3.—Phenol black, B,  $2\frac{1}{4}$  av.oz.; sugar,  $2\frac{1}{4}$  av.oz.; carbolic acid, 1 fl.dr.; sulphuric acid, pure, 25 minims; distilled water, 96 fl.oz. Mix the dye with 6 fl.oz. of cold water, allow to stand for 2 hours, then add the remainder of the water, in the boiling condition, and the other ingredients, and stir about until dissolved. This ink writes a handsome blue-black. For school purposes, it may be cheapened by reducing the dye even to  $1\frac{1}{2}$  av.oz.

4.—*Aniline Ink*.—Methyl violet, 4 gr.; Bengal green, 5 gr.; Bismarck brown, 3 gr.; gum arabic, 20 gr.; water, 4 oz. This makes a good copying ink, and costs only a few cents a quart. Knowledge of proper manipulation is essential to the making of a satisfactory gall ink. No great skill, however, is required to weigh out a few grains of aniline colors and dump them into a bottle of water.

### Blue Inks.

1.—Bruised galls, 3 lb.; sulphate of iron, 1 lb.; gum arabic, 1 lb.; vinegar, 1 pt.; water, sufficient to make 3 gal.; indigo carmine, sufficient to give a blue tint. Macerate, with frequent shaking, for 14 days, and then decant. Inks of this type are also frequently called "writ-

## (Inks)

ing fluids." The "fluid" is very pale until exposed to the air, and the indigo answers the double purpose of rendering it more visible in writing and of making the ink more resistant against bleaching agents.

2.—The following is a simplification of the usual form: Tannic acid, 200 gr.; gallic acid, 50 gr.; sulphate of iron, 1 oz.; indigo carmine, neutral, 320 gr.; powdered cloves, 5 gr.; water, 1 pt. Dissolve the tannic and gallic acids in the water. To this solution add the iron salt, and filter through cotton. Then add the indigo carmine, and lastly, the cloves.

3.—*Special Formula for Blue*.—Dissolve 15 gr. of aniline blue in 1 oz. of alcohol, and add 6 oz. in distilled water. Boil in proper vessel, until odor of alcohol has disappeared. Then add 3 dr. of powdered gum arabic, dissolved in 4 oz. of distilled water. Finally, filter. You will perceive that there is some considerable difference in the above special formula, but there can be no harm in making it too strong, as it is no difficult matter to dilute with distilled water to taste.

4.—Resorcin blue, M, 48 gr.; sugar, 192 gr.; oxalic acid, 10 gr.; distilled water, 19 $\frac{1}{2}$  fl.oz. This ink writes a handsome blue, and flows readily, but has the disadvantage of somewhat corroding the pen, and hence the latter should be cleaned frequently.

### Brown Ink.

1.—By adding to the violet ink finely powdered bichromate of potash, in the proportion of from 15 to 30 gr. to 1 oz., various shades of brown and snuff color are obtained.

2.—A strong decoction of catechu. The shade may be varied by the cautious addition of a little weak solution of bichromate of potash.

3.—A strong decoction of logwood, with a very little bichromate of potash.

### Canceling Postage Stamps.

Lampblack, 1 av.oz.; gum arabic, 164 gr.; glycerine, 2 fl.dr.; water, 80 minims. Dissolve the gum in the water, add the glycerine, and filter. Then triturate the lampblack with the filtrate until a uniform product is obtained.

### Carbon Ink.

Genuine India ink, rubbed down with good black ink until it will flow easily from a pen. This ink resists chlorine and oxalic acid.

## Writing Materials

### (Inks)

#### **Carmine Ink.** (See Red or Carmine.)

#### **Celluloid, Inks for Writing on.**

1.—Ferric chloride, 10 parts; tannin, 15 parts; acetone, 100 parts. Dissolve the ferric chloride in a portion of the acetone, and the tannin in the residue, and mix the two solutions. Any pen may be used with the liquid.

2.—Pale drying varnish, 2 oz.; best quality black printing ink, 8 oz.; aniline blue, soluble in oil,  $\frac{1}{2}$  oz. Other colors may be made by mixing the oil-soluble anilines with pale drying varnish.

#### **Chrome Ink.**

Extract of logwood,  $\frac{1}{2}$  oz.; gum,  $\frac{1}{4}$  oz.; water, 1 pt. Dissolve also, in 12 oz. of water,  $\frac{1}{2}$  oz. of yellow chromate of potash (or  $\frac{1}{2}$  oz. of bichromate and bicarbonate of potash), and mix the two solutions. The ink is ready for immediate use.

#### **Copying Ink.**

1.—**Black.**—a.—Mix about 3 pt. of jet black writing ink and 1 pt. of glycerine. This, if used on glazed paper, will not dry for hours, and will yield one or two fair, neat dry copies by simple pressure of the hand, in any good letter copybook. The writing should not be excessively fine nor the strokes uneven or heavy. To prevent setting off, the leaves, after copying, should be removed by blotting paper. The copies and the originals are neater than when water is used.

b.—A black copying ink which flows easily from the pen, and will give very sharp copies without the aid of a press, can be prepared thus: Coarsely broken extract of logwood, 1 oz., and crystallized carbonate of soda, 2 dr., are placed in a porcelain capsule with 8 oz. of distilled water, and heated until the solution is of a deep red color, and all the extract is dissolved. The capsule is then taken from the fire. Stir well into the mixture 1 oz. of glycerine, sp. gr. 1.25, 15 gr. of neutral chromate of potash, dissolved in a little water, and 2 dr. of finely pulverized gum arabic, which may be previously dissolved in a little hot water so as to produce a mucilaginous solution. The ink is now complete and ready for use.

c.—The following, if good materials are used, and care is taken in the manipulations, will give an excellent black copying ink: Into a clean jar put 425 parts of Aleppo galls, coarsely powdered, and pour over them 4,500 parts of water and 56 parts of glycerine. Set aside to macerate for 10 days, with frequent stirring up

### (Inks)

from the bottom. Dissolve 70 parts of gum arabic in sufficient water, and add to the liquid. Dissolve 170 parts of crystalline iron sulphate, c. p., in sufficient hot water, and add the solution to the foregoing. Let the whole now stand 14 days longer, with an occasional agitation, and then strain off. Add 150 parts of loaf sugar, and dissolve. Finally, filter. This is the best black ink made, and is exclusively used in all the correspondence of the Bank of England. If the ink does not copy freely enough, add a little more sugar or a trifle of glucose.

2.—**Alizarin Blue Copying Ink.**—In 20 parts of fuming sulphuric acid dissolve 5 parts of indigo, and to the solution add 100 parts of extract of aqueous myrobulous and 10.5 parts of iron filings or turning shavings. Finally, add gum arabic, 1.5 parts; sugar, 7.5 parts; sulphuric acid, 60° B., 10.5 parts; aniline blue, 1.5 parts; carbolic acid, 0.5 part; mirobalan extract, to make 1,000 parts. This ink, when first used, has a bluish tint, afterward becoming black.

3.—**Alizarin Green Copying Ink.**—In 100 parts of aqueous extract of gall apples dissolve iron sulphate, 30 parts; copper sulphate, 0.5 part; sulphuric acid, 2 parts; sugar, 8 parts; wood vinegar, rectified, 50 parts; indigo carmine, 30 parts.

4.—**Ink Which Will Copy on Dry Paper.**—Water-soluble aniline black, 30 parts; water-soluble aniline blue, 2 parts; ammonia alum, 16 parts; glycerine, 1,000 parts; water, enough to make 3,000 parts.

5.—**Red Copying Ink.** Dissolve 50 parts of extract of logwood in a mortar, in 750 parts of distilled water, without the aid of heat; add 2 parts of chromate of potassium, and set aside. After 24 hours add a solution of 3 parts of oxalic acid, 20 parts of oxalate of ammonium and 40 parts of sulphate of aluminum in 200 parts of distilled water, and again set aside for 24 hours. Now raise it once to boiling in a bright copper kettle, add 50 parts of vinegar, and, after cooling, fill into bottles, and cork. After a fortnight, decant. This ink is red in thin layers, writes red, gives excellent copies in brownish color, and turns blackish brown upon the paper.

6.—**Tissue Paper.**—A copying ink that will copy legibly on tissue paper without water or a copying press, can be made by taking 10 oz. of nigrosine, C. P. fine, glucose A,  $1\frac{1}{2}$  oz.; hot water,  $1\frac{1}{4}$  pt.; and glycerine,  $1\frac{1}{4}$  oz. The nigrosine is to be dissolved by trituration in the hot water, the other ingredients to be then added, and the mixture strained through a piece

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of silk. If too thick to flow from the pen readily, it can be diluted with water.

7.—*Violet Copying Ink.*—For blue violet, dissolve in 300 parts of boiling water methyl violet 5B, Hofmann violet 3B, or gentiana violet B. For reddish violet, dissolve in a similar quantity of water, methyl violet BR. A small quantity of sugar added to these inks improves their copying qualities. If the writing, when dry, retains a bronzy appearance, more water must be added.

### Diamond Ink.

The so-called "diamond inks" are liquids used for etching glass. (See chapter on GLASS.)

### Drawing Ink.

1.—A very black and indelible drawing ink may be made by dissolving shellac in a hot-water solution of borax, and rubbing up in this solution a fine quality of India ink. After using, dip the drawing pen in alcohol, and wipe dry, to keep it clean and bright.

2.—The addition of 1 part of carbolic acid to 80 parts of the fluid India ink, while it does not impair its fluidity, causes it to dry rapidly, even in heavy lines, so that they can be varnished over. The proper amount of carbolic acid to be added in any case may be ascertained by adding, drop by drop, the ordinary apothecary's solution of it in alcohol until varnishing does not affect the definition of a test line by causing it to run. The addition of too much carbolic acid is indicated by the transparency of the line, and the inability to draw fine lines, a condition easily remedied by the addition of more of the fluid ink.

### Enameled Cards, Ink for.

An ink that may be applied to enameled calling or playing cards, that will show perfectly plain, and that will not destroy the gloss, is printer's ink, diluted with oil of lavender.

### Enamels, White, Black, for Writing on.

Use vegetable black, mixed with a hard-drying varnish, and thinned with boiled oil and turpentine.

### Fireproof Ink.

1.—White paper has been prepared by using borax, asbestos, etc., which will not burn. There has, so far, been no ink prepared which, when subjected to fire, is not either destroyed or rendered illegible. A formula which it is claimed will furnish an ink the legibility of which will

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not be affected by fire, is as follows: Mix 40 parts of finely powdered graphite, 72 parts of gum copal, 3.5 parts of ferrous sulphate, 3.5 parts of tincture of galls and 14 parts of indigo sulphate; add to a sufficient quantity of water, boil, and then cool, when the ink is ready for use.

2.—The ink is made from 85 parts of graphite, 0.8 part of copal varnish, 7.5 parts of copperas, 30 parts of tincture of nutgalls, and a sufficient quantity of indigo carmine.

### Frostproof Ink.

Aniline black, 1 dr.; rub with a mixture of concentrated hydrochloric acid, 1 dr.; pure alcohol, 10 oz. The deep blue solution obtained is diluted with a hot solution of concentrated glycerine, 1½ dr., in 4 oz. of water. This ink does not injure steel pens, is unaffected by concentrated mineral acids or strong alkalis, and will not freeze at a temperature of 22° or 24° below zero.

### Glass.

*Labeling Bottles, Ink for.*—1.—Take 20 grams of brown shellac, which is dissolved in 150 c.c. of lamp spirit; then prepare a solution of 35 grams of borax in 250 c.c. of distilled water, and pour the first solution slowly into the second. Now a dye-stuff has to be added to the product received; for this, 1 gram of methyl violet is well suited. The ink prepared in this manner is said to be indestructible.

2.—Liquid I, in one bottle: Dissolve 36 grams of sodium fluoride in ½ l. of distilled water, and add 7 grams of potassium sulphate. Liquid II, in another bottle: Dissolve zinc chloride, 14 grams, in ½ l. of distilled water, and add 65 grams of concentrated hydrochloric acid. For use, mix equal parts together, and add a little dissolved India ink to render the writing more visible. The mixing cannot, however, be conducted in a vessel. It is best to use a cube of paraffine which has been hollowed out.

### Gluten Ink.

Dissolve wheat gluten, free from starch, in weak acetic acid, of the strength of common vinegar; mix 10 gr. of lampblack and 2 gr. of indigo with 4 oz. of the solution, and a drop or two of oil of cloves.

### Gold Ink.

Honey and gold leaf, equal parts; triturate until the gold is reduced to the finest possible state of division, agitate with 30 parts of hot water, and allow it

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### (Inks)

to settle. Decant the water, and repeat the washing several times; finally, dry the gold, and mix it with a little weak gum water, for use.

*Liquid Gold for Vellum.*—Grind gold leaf with gum water; add a little bichloride of mercury, and bottle.

### Green Ink.

1.—A good bright green aniline ink may be made as follows: Aniline green, soluble, 2 parts; glycerine, 16 parts; alcohol, 112 parts; mucilage of gum arabic, 4 parts. Dissolve the aniline in the alcohol, and add the other ingredients. Most of the gum arabic precipitates, but according to the author of the formula (Nelson) it has the effect of rendering the ink slow-flowing enough to write with. Filter.

2.—Water-soluble bluish methyl green, 96 gr.; sugar, 192 gr.; distilled water, 19½ fl.oz. Prepare in the same manner as violet ink.

3.—Klaproth's Green Ink.—This has the following formula: Crystallized copper acetate, 4 parts; cream of tartar, 2 parts; water, 16 parts. Boil the copper and cream of tartar with the water, in a porcelain kettle (a clean copper one will answer), until the solution acquires an intensely green color, then filter, and add 1 part of mucilage of gum arabic.

### Hektograph Inks.

*Black.*—Methyl violet, 10 parts; nigrosine, 20 parts; glycerine, 30 parts; gum arabic, 5 parts; alcohol, 60 parts.

*Blue.*—Resorcin blue, M, 10 parts; dilute acetic acid, 1 part; water, 85 parts; glycerine, 4 parts; alcohol, 10 parts. Dissolve by the aid of heat.

*Green.*—Water-soluble aniline green, 15 parts; glycerine, 10 parts; water, 50 parts; alcohol, 10 parts. The writing is allowed to dry without blotting. The pad having been moistened with clean water, the paper is placed on it, face inward, of course, and rubbed gently but firmly over every portion, care being taken to prevent it changing position. It is allowed to remain on the pad for from 2 to 5 minutes, and is then carefully removed. Copies are now taken by pressing dry paper on this surface and removing immediately. The operation should be carried out with as little interruption as possible. The *New Idea* states that the distinctness and sharpness of hektograph prints may be very materially heightened by wetting the paper upon which the prints are to be made with alcohol, and removing the excess of alcohol

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by blotting paper. After using the pad the ink should be removed from the surface immediately with a soft sponge and warm water, drying it well. It will then be ready for another operation. It may be used a great many times, if properly manipulated.

*Purple.*—Methyl violet, 2 parts; alcohol, 2 parts; sugar, 1 part; glycerine, 4 parts; water, 24 parts. Dissolve the violet in the alcohol, mixed with the glycerine; dissolve the sugar in the water; mix both solutions.

*Red.*—Fuchsin, 10 parts; alcohol, 10 parts; glycerine, 10 parts; water, 50 parts.

### Horticultural Ink.

Blue vitriol, 1 oz.; sal ammoniac, ½ oz. (both in powder); vinegar, ¼ pt.; dissolve. A little lampblack or vermilion may be added. For iron, tin or steel plate.

### Indelible Inks.

1.—Böttger prepares an ink that does not corrode steel pens, by triturating 3.65 gr. of aniline black with 22 gr. of alcohol and 4 drops of hydrochloric acid; a porcelain mortar is employed, and the paste thus produced is mixed with 1.82 gr. of gum arabic, previously dissolved in 85 gr. of hot water. If this ink be added to an alcoholic solution of shellac (21 gr. of lac to 85 gr. of alcohol), a black product results, suitable for coloring leather and wood.

2.—If the ink is to be used for writing or drawing, and there is no danger of the letters, etc., being rubbed off mechanically, printing ink or India ink may be used.

3.—Printing ink sinks into woven fabrics to a considerable depth, and will last a long time. It is probably one of the cheapest marking inks to be used with stencils.

4.—In many cases, India ink answers as well, and in some cases, as for engraving valuable documents, it is the only safe ink, since nothing but the destruction of the document itself will be able to obliterate it. It is made by triturating 100 gr. of best India ink (Chinese) with very dilute hydrochloric acid (about 22 parts of absolute hydrochloric acid in 1,000 parts), or with a solution of acetate of manganese in diluted acetic acid.

5.—Another fine indelible ink, which resists all ordinary reagents, is made by means of vanadium. Vanadium and its salts are rather expensive still, although their price has fallen during the last few

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years to about one-tenth of what it was formerly.

6.—This ink consists of lampblack and caustic soda, mixed with gelatine and caustic soda. It is said to be indelible, and to resemble China ink.

7.—India ink, ground up with ordinary black writing ink, forms a cheap indelible ink for common purposes. It will resist the action of chlorine, most acids, and even abluition with a brush or sponge.

8.—Dissolve 4 parts of aniline black in 16 parts, by weight, of alcohol, with 60 drops of strong hydrochloric acid, and dilute the dark blue solution with 90 parts, by weight, of water, in which 6 parts of gum arabic have been previously dissolved. This ink is said not to act upon steel pens or to suffer any alteration by alkalies or acids.

9.—By adding ferrocyanide of potassium to ordinary ink, an indelible writing ink may be obtained. The removal of such an ink by acid would result in the production of Prussian blue.

10.—Gelatine, 2 gr.; bichromate of potassium, 2 gr.; nigrosine, 10 gr.; water, 2 fl.oz. Dissolve the gelatine and nigrosine in most of the water, and the bichromate in the remainder. Mix the two solutions in an amber-colored bottle.

11.—Dissolve, with the assistance of heat, 20 parts of brown shellac in a solution of 30 parts of borax in 300 to 400 parts of water, and filter the solution while hot. Then add to the filtrate a solution of 10 parts of aniline black soluble in water, 3-10 part of tannin, 1-10 part of picric acid, 15 parts of spirit of sal ammoniac, and  $\frac{1}{4}$  oz. of water.

12.—*Aniline Inks, To Render Indelible.*—Coat the reproduction with some preparation. An excellent compound consists of collodion dissolved to the consistency used by photographers, with 2% of stearine added.

13.—*Gold Indelible Ink.*—Make two solutions, as follows: (a) Chloride of gold and sodium, 1 part; water, 10 parts; gum, 2 parts. (b) Oxalic acid, 1 part; water, 5 parts; gum, 2 parts. The cloth or stuff to be written on should be moistened with liquid (b). Let dry, and then write upon the prepared place with liquid (a), using, preferably, a quill pen. Pass a hot iron over the mark, pressing heavily.

### Indestructible Ink.

Graphite, impalp., powder, 400 parts; gum copal, 720 parts; iron sulphate, 35 parts; tincture of galls, 35 parts; indigo sulphate, 140 parts. Mix the

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materials, and boil them in sufficient water to make a fluid of the desired consistency. After boiling for a few minutes let it stand a while for the grosser particles to settle. Then decant and bottle.

### India Ink.

1.—India ink consists of finely divided carbon, cemented together by certain glutinous vegetable juices, gum, gelatine, etc. The precise nature of the cement or mucilage used by the Chinese in the manufacture of their inks is not known, but the greater part of the ink now sold as India ink consists of fine lampblack and glue. Purify fine lampblack by washing it with a solution of caustic soda, dry, and make it into a thick paste with a weak solution of gelatine containing a few drops of musk essence and about half as much ambergris; mold, and dry. Instead of gelatine the following solution may be used: Seed lac, 1 oz.; borax,  $\frac{1}{4}$  oz.; water, 1 pt.; boil until the solution is effected, and make up with water to  $\frac{3}{4}$  pt.

2.—Purify fine lampblack by washing it with a solution of caustic soda, dry, and make into a thick paste with a weak solution of gelatine containing a few drops of musk essence and about half as much ambergris; mold, and dry. Instead of gelatine the following solution may be used: Seed lac, 1 oz.; borax,  $\frac{1}{4}$  oz.; water, 1 pt.; boil until a solution is effected, and make up with water to  $\frac{3}{4}$  pt.

3.—Mix the finest lampblack with a solution of 100 gr. of lac with 20 gr. of borax and 4 oz. of water.

4.—*Imitation of India Ink.*—Grind together lampblack and gelatine, the gelatinizing power of which has been partly destroyed by boiling with water. Scent with camphor, and make into sticks.

5.—*Liquid India Ink.*—A little glycerine added acts as a preservative, and causes the ink to flow well. Too much glycerine should not be used, as it will prevent the ink from drying, and in this case it is, of course, easily blotted or smeared. Keep in well corked bottles.

### Indorsing Inks.

Dissolve 1 part of aniline blue, violet or magenta, according to the color required, in a mixture of 30 parts of alcohol and 30 parts of glycerine.

### Japan Ink.

Dissolve in  $\frac{1}{2}$  pt. of soft water  $\frac{3}{8}$  oz. of potassium bichromate, and add the solution to 6 oz. of logwood extract, dis-

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solved in 1 gal. of water; then dissolve in 1 gal. of water by continued boiling, borax, 6 oz.; shellac,  $1\frac{1}{2}$  oz. Mix all together while warm, and add 3 oz. of ammonia.

**Marble.** (See Stone or Marble.)

#### Marking Ink.

*With Base of Aniline Hydrochlorate.*—Aniline hydrochlorate is a colorless salt, possessing a strong affinity for water, and forming deep black compounds with various metallic, and especially with copper salts. Two liquids are therefore required in preparing the above ink; they should be mixed shortly before use, and applied immediately, as the black or dark gray deposit is quickly precipitated. The aniline salt mixture may also be applied first and the developing fluid immediately afterward; some difficulty may, however, arise on account of the necessity of both applications exactly coinciding, but the signs thus obtained are more lasting.

1.—Parts by weight: (a) Cupric chloride, 10.34; sal ammoniac, 6.89; sodium chlorate, 13.72; distilled water, 68.95. (b) Aniline hydrochlorate, 16.40; gum arabic, 13; glycerine, 3.40; distilled water, 33. Both liquids must be mixed shortly before use, in the proportion of 1:1, and immediately applied.

2.—Parts by weight: (a) Cupric chloride, 2.38; spirit of sal ammoniac, 95.23; sodium chloride (common salt), 2.38. (b) Aniline hydrochlorate, 94.28; gum arabic, 35.28; glycerine, 35.28; distilled water, 35.29. The liquids to be mixed before use, in the proportion of 4 parts of the first to 1 part of the second.

3.—Parts by weight: (a) Cupric chloride, 10; sodium chlorate, 12.60; sal ammoniac, 6.30; distilled water, 71.10. (b) Aniline hydrochlorate, 24.60, in 36 parts of distilled water; gum arabic, 1.25; glycerine, 13.65; distilled water, 24.60.

4.—*Bags, Ink for.*—A good, cheap and quick-drying ink for marking bags can be compounded in a simple manner. Let 250 grams of rosin and 100 grams of ordinary shellac dissolve in  $\frac{1}{2}$  l. of spirit, with moderate heat, in a closed bottle for 12 hours. Upon shaking well together, stir into this varnish substance 200 grams of Frankfort black, and the ink, which is dissolved neither by water nor oil, is ready. Any other color may be used in place of the Frankfort black.

**Metallic Surfaces, Ink for Marking Polished.** (See also Silver.)

Rosin, 20 parts; alcohol, 150 parts; borax, 35 parts; methylene blue, 1 part;

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water, 250 parts. Dissolve the rosin in the alcohol and the blue in the solution. Dissolve the borax in the water, and mix the solutions. Any other color may be substituted for the blue: For black, nigrosine; for red, eosine, etc. Use sufficient to make the mark plain and legible.

#### Mimeograph Ink.

For use with any kind of a stencil, ink must necessarily be thick—more like a paste than like writing fluid, and it would apparently be best to use for the coloring agent some substance not soluble in the liquid employed to carry it, as it would then have less tendency to “creep” under the edges of the stencil and so spoil the impression. To grind a pigment fine enough for the purpose would be quite laborious, if done by hand, but colors may be obtained in the market ground in water, under the name of “distemper colors.” An addition of gum arabic or dextrine mucilage would be necessary to hold the pigment to the paper on drying, and a very small quantity of glycerine would prevent the mixture from drying too readily. Aniline colors, ground with dextrine mucilage, can also probably be made to answer. The ink used for mimeograph copying process is of a pasty character, and almost any good stencil ink will answer the purpose. A few formulas follow:

1.—Shellac, 2 oz.; borax, 2 oz.; water, 25 oz.; gum arabic, 2 oz.; and of Venetian red, lampblack, Prussian blue, or any desired coloring substance, a sufficiency. Boil the shellac, borax and some water until they are dissolved; add the gum arabic, and withdraw from the fire. When the solution has become cold, complete to 25 oz. with water and more of the coloring substance to bring the ink to a suitable consistency.

2.—*Printers' ink*, made thin, is used on the mimeograph. The manufacture of inks of this type calls for a considerable amount of experience and skill. As much depends upon the manipulation as upon the formula. The basis of printers' ink is a good quality of linseed oil, thoroughly boiled. It is boiled until it smokes, then ignited, allowed to burn about half an hour, then smothered, and again boiled until it can be pulled out into strings about  $\frac{1}{2}$  in. long. Then a little rosin is added, and some soap, and the whole is boiled again, after which the pigment, usually lampblack, is thoroughly incorporated by machinery. The amount of rosin and soap to be incorporated varies with the conditions of use, and governs the

## Writing Materials

### (Inks)

consistency of the ink. The pigment must be very thoroughly triturated in to get good results.

3.—A simple substitute formula is the following: Copaiba, 9 oz.; lampblack, 3 oz.; indigo, 5 dr.; Prussian blue, 5 dr.; Indian red, 6 dr.; yellow soap, dried and powdered, 2 or 3 oz. These must be very thoroughly triturated together. The consistency, which is an important feature of this kind of ink, may be controlled by the quantity of soap used.

4.—Boiled linseed oil, 16 lb.; purified indigo, 3 oz.; Berlin blue, 3 oz.; finest lampblack, 8 lb. The boiled linseed oil should be used hot. A mixture of turpentine and ligroine is employed in thinning the base.

5.—Rub up to a fine powder on a marble slab: Rosin, 10 parts; lampblack, 3 parts; Berlin blue, indigo, indigo red, of each,  $\frac{1}{4}$  part; yellow rosin soap,  $\frac{1}{2}$  part. If blue ink is desired, 3 oz. of ultramarine blue may be substituted for the 3 parts of lampblack. Experiments are being carried on to substitute boiling linseed oil by a mixture of 50 parts of rosin dissolved in 25 parts of paraffine oil. This is then incorporated with the powders for the production of colors, etc.

### Neostyle or Cyclostyle Ink.

Grind aniline color with glycerine, thinning with spirit, if desired. A few drops of oil of cloves will give a pleasant odor, if it is wished.

### Oil, To Remove from Ink.

Add a little oxgall and vinegar to the ink.

### Papyrograph Ink.

Dissolve any of the soluble dyes in warm glycerine.

### Paste Form.

Tannic acid, 1 oz.; tartaric acid, 10 gr.; acacia, 1 dr.; phenol black, B, 30 gr.; ferrous sulphate, 1 oz.; glycerine, 1 fl.dr.; salicylic acid, 10 gr.; water, sufficient. Thoroughly mix the solids, all in fine powder, and add the glycerine and sufficient water to make a paste, of which a small quantity is to be dissolved in water when required for use.

### Preserving Ink.

Add from 0.1 to 0.2 gram of salicylic acid to 1 l. of ink.

### Purple Ink.

Aniline purple, 80 gr.; alcohol, 12 fl.dr.; mucilage of acacia, 10 fl.dr.; water, 17

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fl.oz. This color is brilliant at first, but is liable to fade.

### Red and Carmine Inks.

1.—Genuine carmine ink is made by placing 15 to 20 gr. of carmine in 3 oz. of water, and then to add so much strong liquid ammonia, drop by drop, till all the carmine is dissolved; then add 20 gr. of powdered gum arabic. If you want a cheaper ink, substitute droplake for the carmine, but it is not so beautiful.

2.—Macerate for 2 days, 5 parts of coarsely powdered cochineal and 10 parts of potassium carbonate with 100 parts of distilled water, then add 30 parts of neutral potassium tartrate and 2 parts of chemically pure alum. Heat the mixture until the carbonic oxide is given off, add 5 parts of alcohol, and filter. Wash the filter with 10 parts of distilled water, dissolve 5 parts of gum arabic in the filtrate, and add a little oil of cloves.

3.—Erythrosin, 1 part; water, 99 parts. Thicken with gum arabic, and add a little boric acid or other preservative.

4.—Pure carmine (No. 40), 2 dr.; ammonia water, 5 dr.; water,  $3\frac{1}{2}$  oz.; mucilage of gum arabic, 3 dr. This ink should be put in rubber or glass-stopped bottles, as ammonia affects cork.

5.—Winckler's.—Rub fine 6 parts of red carmine with 75 parts of liquid water glass. Dilute this mixture with 675 parts of rain water. Let it stand a few days, and pour off the fluid.

6.—Böttger rubs up carmine and silicate of soda, and then adds to this mixture a concentrated silicate solution till the whole is of sufficient consistency to write well. The product gives a very brilliant ink when dry, and dries quickly. It must be kept out of contact of air in a well closed vessel.

7.—Dissolve 20 gr. of pure carmine in 3 fl.oz. of liquid ammonia; add 18 gr. of powdered gum.

8.—Best ground Brazil wood, 2 oz.; diluted acetic acid,  $\frac{1}{2}$  pt.; alum,  $\frac{1}{4}$  oz. Boil them slowly in an enameled vessel for half an hour, strain, and add  $\frac{1}{2}$  oz. of gum.

### Resinous Safety Ink.

Add 10 parts each of pine rosin and crystallized soda to 100 parts of water, and boil till a clear solution is obtained. To save time, a mixture of 7 parts of soda and 3 parts of soda lye may also be used. Then rub together 4 parts of rubber and 2 parts of lampblack, dilute with water, and add the mixture to the rosin solution.

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### (Inks)

#### Rosin Oil Ink.

Rosin oil,  $1\frac{1}{2}$  lb.; rosin,  $19\frac{1}{2}$  oz.; soft soap,  $2\frac{1}{4}$  oz. Melt together. Add lamp-black when cold.

#### Ruling Inks.

1.—*Black*.—Add fresh gall to good black ink. Do not cork, as it prevents it from turning black.

2.—*Blue*.—Take 4 oz. of vitriol, best quality, to 1 oz. of indigo; pulverize the indigo very fine; put the indigo on the vitriol; let them stand exposed to the air for 6 days, or until dissolved; then fill the pot with chalk, add  $\frac{1}{2}$  gill of fresh gall, boiling it before use.

3.—*Faint Lines, Ink to Rule*.—Dissolve in a small quantity of warm water 20 parts of Prussian blue, by the aid of 3 parts of potassium ferrocyanide, and dilute the solution with thin gum water until the proper degree of color is obtained. See also *Black Ink*, above.

4.—*Red*.—One pound of Brazil wood to 1 gal. of best vinegar; let the vinegar simmer before you add the wood, then let them simmer together for half an hour; then add  $\frac{3}{4}$  lb. of alum to set the color; strain it through a woollen or cotton cloth, cork it tight in a stone or glass bottle. For ruling, add  $\frac{1}{2}$  gill of fresh gall to 1 qt. of red ink, then cork it up in a bottle for use.

#### Shading Inks.

1.—Paris violet, 2 parts; water, 6 parts; mucilage of acacia, 2 parts.

2.—Rosaniline acetate, 2 parts; alcohol, 1 part; water, 10 parts; mucilage of acacia, 2 parts.

3.—Bordeaux red, 3 parts; alcohol, 2 parts; water, 20 parts; mucilage of acacia, 2 parts.

4.—Methyl violet, 1 part; distilled water, 7 parts; mucilage of acacia, 2 parts.

5.—Water-soluble nigrosine, 1 part; water, 9 parts; mucilage of acacia, 1 part.

6.—*Black, for Shading Pens*.—The following recipe is for a glossy black ink for patent shading pens: Powdered nutgalls, 18 parts; iron sulphate, 8 parts; gum arabic, 7 parts; pure water, 145 parts. The galls are first boiled in 130 parts of water, the iron sulphate and gum arabic dissolved in 15 parts of water, and this solution then slowly added to the former.

#### Silver, To Write on with a Permanent Black.

Take burnt lead, and pulverize it. Incorporate it next with sulphur and vine-

### (Inks)

gar, to the consistency of a paint, and write with it on any silver plate. Let it dry, then present it to the fire so as to heat the work a little, and it is completed.

#### Silver Ink.

1.—For silver ink, the process is the same as for gold, substituting silver leaf for the gold leaf. (See *Gold Ink*, above.)

2.—Mix 1 oz. of finest black tin, in shavings, with 2 oz. of mercury till they become perfectly amalgamated. Then shake up in a stoppered bottle with enough gum water to give proper consistency. The writing, when dry, will have the appearance of silver.

3.—*Liquid Silver, for Vellum*.—Grind silver leaf with gum water, or white of egg.

#### Sympathetic Inks.

*Inks That Appear Through Heat*.—1.—Write with a concentrated solution of caustic potash. The writing will appear when the paper is submitted to strong heat.

2.—Write with a solution of hydrochlorate of ammonia, in the proportion of 15 parts to 100. The writing will appear when the paper is heated by holding it over a stove, or by passing a hot smoothing iron over it.

3.—A weak solution of nitrate of copper gives an invisible writing, which becomes red through heat.

4.—A very dilute solution of perchloride of copper gives invisible characters that become yellow through heat.

5.—A slightly alcoholic solution of bromide of copper gives perfectly invisible characters, which are made apparent by a gentle heat, and which disappear again through cold.

6.—Write upon rose-colored paper with a solution of chloride of cobalt. The invisible writing will become blue through heat and will disappear on cooling.

7.—Write with a solution of sulphuric acid. The characters will appear in black through heat. This ink has the disadvantage of destroying the paper.

8.—Write with lemon, onion, leek, cabbage or artichoke juice. Characters written with these juices become very visible when the paper is heated.

9.—Digest 1 oz. of zaffre, or oxide of cobalt, at a gentle heat, with 4 oz. of nitromuriatic acid till no more is dissolved; then add 1 oz. of common salt and 16 oz. of water. If this be written with, and the paper held to the fire, the writing becomes green, unless the cobalt should be



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### (Inks)

quite pure, in which case it will be blue. The addition of a little nitrate of iron will then impart the property of becoming green. It is used in chemical landscapes for the foliage.

10.—Put in a vial  $\frac{1}{2}$  oz. of distilled water, 1 dr. of bromide of potassium and 1 dr. of pure sulphate of copper. The solution is nearly colorless, but becomes brown when heated.

11.—Nitrate of nickel and chloride of nickel, in weak solution, form an invisible ink, which becomes green by heating, when the salt contains traces of cobalt, which usually is the case; when pure, it becomes yellow.

12.—When the solution of acetate of protoxide of cobalt contains nickel or iron, the writing made by it will become green when heated; when it is pure, and free from these metals, it becomes blue.

13.—Milk makes a good invisible ink, and buttermilk answers the purpose better. It will not show if written with a clean new pen, and ironing with a hot flatiron is the best way of showing it up. All invisible inks will show on glazed paper; therefore unglazed paper should be used.

14.—Burn flax so that it may be rather smoldered than burned to ashes, then grind it with a miller, on a stone, putting a little alcohol to it; then mix it with a little weak gum water, and what you write, though it seem fair, may be rubbed or washed out.

15.—Boil oxide of cobalt in acetic acid. If a little common salt be added, the writing becomes green when heated; but with niter it becomes a pale rose color.

16.—A weak solution of nitrate of mercury becomes black by heat.

*Inks That Appear Under the Influence of Light.*—1.—Chloride of gold serves for forming characters that appear only as long as the paper is exposed to daylight, say for an hour at least.

2.—Write with a solution made by dissolving 1 part of nitrate of silver in 1,000 parts of distilled water. When submitted to daylight, the writing appears of a slate color, or tawny brown.

*Inks Appearing Through Reagents.*—

1.—If writing be done with a solution of acetate of lead in distilled water, the characters will appear in black upon passing a solution of an alkaline sulphuret over the paper.

2.—Characters written with a very weak solution of chloride of gold will become dark brown upon passing a solution of perchloride of tin over them.

3.—Characters written with a solution

### (Inks)

of gallic acid in water will become black through a solution of sulphate of iron, and brown through the alkalies.

4.—Upon writing on paper that contains but little sizing, with a very clear solution of starch, and submitting the dry characters to the vapor of iodine, or passing over them a weak solution of iodide of potassium, the writing becomes blue, and disappears under the action of a solution of hyposulphite of soda, in the proportions of 1 to 1,000.

5.—Characters written with a 10% solution of nitrate of protoxide of mercury become black when the paper is moistened with liquid ammonia, orange red with a solution of, and gray through heat.

6.—Characters written with a weak solution of the soluble chloride of platinum or iridium become black when the paper is submitted to mercurial vapor. This ink may be used for marking linen. It is indelible.

7.—C. Widemann communicates a new method of making an invisible ink to *Die Natur*. To make the writing or the drawing appear which has been made upon paper with the ink, it is sufficient to dip it into water. On drying, the traces disappear again, and reappear by each succeeding immersion. The ink is made by intimately mixing linseed oil, 1 part; water of ammonia, 20 parts; water, 100 parts. The mixture must be agitated each time before the pen is dipped into it, as a little of the oil may separate and float on top, which would, of course, leave an oily stain upon the paper.

8.—Write with a solution of ferrocyanide of potassium; develop by pressing over the dry, invisible characters a piece of blotting paper moistened with a solution of copper sulphate or of copperas.

9.—Write with pure dilute tincture of iron; develop with a blotter moistened with strong tea.

10.—Writing with iodide of potash and starch becomes blue by the least trace of acid vapors in the atmosphere, or by the presence of ozone. To make it, boil starch, and add a small quantity of iodide of potassium in solution.

11.—Sulphate of copper in very dilute solution will produce an invisible writing, which will turn light blue by vapors of ammonia.

12.—Soluble compounds of antimony will become red by sulphide of hydrogen vapor.

13.—Soluble compounds of arsenic and of peroxide of tin will become yellow by the same vapor.

14.—An acid solution of chloride of

## Writing Materials

### (Inks)

iron is diluted till the writing is invisible when dry. This writing has the remarkable property of becoming red by sulphocyanide vapors (arising from the action of sulphuric acid on sulphocyanide of potassium in a long-necked flask), and it disappears by ammonia, and may alternately be made to appear and disappear by these two vapors.

15.—Writing executed with rice water is visible when dry, but the characters become blue by the application of iodine. This ink was much employed during the Indian mutiny.

16.—Write with a solution of paraffine in benzol. When the solvent has evaporated the paraffine is invisible, but becomes visible on being dusted with lamp-black or powdered graphite, or smoking over a candle flame.

17.—To Write Black Characters with Water.—Mix 10 parts of nutgalls and  $2\frac{1}{2}$  parts of calcined sulphate of iron. Dry thoroughly and reduce to fine powder. Rub this powder over the surface of the paper, and force into the pores by powerful pressure; brush off the loose powder. A pen dipped in water will write black on paper thus treated.

18.—To Write Blue Characters with Water.—Mix sesquisulphate of iron and ferrocyanide of potassium. Prepare the paper in the same manner as for writing black characters with water. Write with water, and the characters will appear blue.

19.—To Produce Brown Writing with Water.—Mix sulphate of copper and ferrocyanide of potassium. Prepare the paper in the same manner as before. The characters written with water will be reddish brown.

20.—There is a well-known proprietary article sold in Paris under the name of "Encre pour les Dames" (ink for ladies). Hager, in a recent scientific journal, states that this consists of an aqueous solution of iodide of starch, and is especially intended for love letters. In four weeks characters written with it disappear, preventing all abuse of letters, and doing away with all documentary evidence of any kind in the hands of the recipient. The signers of bills of exchange who use this ink are, of course, freed from all obligations in the same length of time. Of course, this is criminal.

### Powder.

1.—(Roy).—Various qualities of inks are prepared in powder. By placing a small quantity of this powder in water, ink for writing is immediately obtained.

### (Inks)

One variety, styled indelible ink, is stated to resist the most energetic chemical reagents. It appears to consist mainly of charcoal and glycerine.

2.—Extract of logwood, 1 oz.; potassium bichromate, 48 gr.; sodium carbonate,  $3\frac{1}{2}$  dr.; gum arabic, 2 dr.; indigo carmine, 15 gr. For 1 qt. of ink.

**Rubber Stamp Inks.** (See Stamps, Ink for.)

### Solid Inks.

*Cakes.*—May be prepared by evaporating good ink to dryness in shallow dishes, but the best results are obtained by dissolving Chinese ink in water.

**Stamps, Inks for.** (See also Rubber Stamp Inks.)

*Inks in Which the Colors Are Suspended.*—These inks should be labeled "Shake before using."

1.—Black.—Lampblack (gasblack), 3 parts; olive oil, 17 parts.

2.—Blue.—a.—Aniline blue, 3 parts; oleic acid, 6 parts; castor oil, 94 parts.

b.—Blue-Black.—Aniline black, 5 parts; oleic acid, 6 parts; castor oil, 94 parts.

c.—Dark Blue.—Ultramarine, 1 part; Paris blue, 2 parts; olive oil, 17 parts.

3.—Green.—Aniline blue, 25 parts; aniline lemon yellow, 15 parts; oleic acid, 50 parts; castor oil, 950 parts.

4.—Red.—a.—Vermilion, 2 parts; olive oil, 3 parts.

b.—Bordeaux red, 15 parts; aniline scarlet, 15 parts; crude oleic acid, 50 parts; castor oil, 950 parts.

5.—Violet.—Aniline violet, 3 parts; oleic acid, 5 parts; castor oil, 95 parts.

In preparing these inks, rub the aniline (oil-soluble) to perfect smoothness with oleic acid; then add the oil, little by little, with constant rubbing. After incorporation of the whole of the oil, heat the mixture, under constant stirring, to about 45° V. (167° F.).

*Metal Stamp Inks.*—Stamping inks designed for metal stamps are best prepared with oil; those for rubber stamps, with glycerine. (See also Typewriter Inks.)

Blue.—Ultramarine, 25 grams; olive oil, 75 grams. Mix them intimately with the aid of slab and muller.

Brass Stamps, Black Ink for.—1.—Ordinary printers' ink, thinned with olive oil.

2.—Aniline black, E, 3 dr.; distilled water, 10 dr.; wood vinegar, 10 dr.; alcohol, 10 dr.; glycerine, 7 oz. Mix, and dissolve.

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### (Inks)

**Green.**—Copper, subacetate, 25 grams; oleic acid, 5 grams; olive oil, 70 grams. Mix as in Blue.

**Red.**—Cinnabar, 40 grams; olive oil, 60 grams. Mix as for Blue.

**Steel Stamp Ink for.**—Copaiba, 9 oz.; lampblack, 3 oz.; indigo, 5 dr.; Prussian blue, 5 dr.; Indian red,  $\frac{3}{4}$  oz.; dried yellow soap, 3 oz. Grind to a uniform smoothness.

**Rubber Stamp Inks.**—1.—In order to make the ink directed below, first make an oil mixture, as follows: Oil Mixture: Oleic acid, purified, 5 parts; castor oil, 55 parts. Mix thoroughly.

2. **Black Ink.** Oil mixture, 300 parts; oil-soluble black, 15 parts. Proceed as directed above.

3. **Blue Ink.** Oil mixture, 300 parts; oil-soluble blue, 15 parts. Heat the oil mixture on a water bath to blood temperature. Shave the color into small pieces, and stir into the oil mixture until it is completely dissolved. Let it stand for 12 hours, and then strain through a double thickness of cheese cloth.

4.—**Glycerine Stamp Ink.**—Aniline water blue, 1B, 3 dr.; distilled water, 10 dr.; acetic acid, 2 dr.; alcohol,  $1\frac{1}{2}$  oz.; glycerine, enough to make 10 oz. Make a solution by rubbing in a mortar. In the same way, inks of the following colors may be prepared with the above compound menstruum, substituting, of course, the pigment named for the aniline water-blue in the formula given: Violet: Methyl violet (3B), 2 dr. Red: Diamond fuchsin (I), 2 dr. Green: Aniline green (D), 4 dr. Brown: Vesuvine (B), 5 dr. Black: Deep black (E), 3 dr. For bright red, omit the acid from the solution, replacing it by water, and using 3 dr. of eosin.

5. **Red Ink.** Oil mixture, 150 parts; oil-soluble red, 2 parts. Proceed as for blue ink, except that the color does not have to be shaved. While castor oil is not a drying oil, yet when it is mixed with oleic acid, which serves as a mordant, it will bite the oil-soluble aniline color into the paper, and thus prevent it from "rubbing." Another thing in favor of the combination is that the oil-soluble colors will not be affected by the moisture of the hand which may be rubbed over them. The castor oil prevents the ink from drying on the pad.

6.—**Violet Ink.**—Oil mixture, 150 parts; oil-soluble violet, 4 parts. Proceed as for blue ink.

**Rubber Stamp Pads.**—The following is said to be a cushion that will give color permanently. It consists of a

### (Inks)

box filled with an elastic composition, saturated with a suitable color. The cushion fulfils its purpose for years without being renewed, always contains sufficient moisture, which is drawn from the atmosphere, and continues to act as a color stamp cushion so long as a remnant of the mass or composition remains in the box or receptacle. This cushion or pad is too soft to be self-supporting, but should be held in a low, flat pan, and have a permanent cloth cover. The composition consists preferably of 1 part of gelatine, 1 part of water, 6 parts of glycerine and 6 parts of coloring matter. A suitable black color can be made from the following materials: 1 part gelatine glue, 3 parts lampblack, aniline black, or a suitable quantity of logwood extract, 10 parts of glycerine, 1 part absolute alcohol, 2 parts of water, 1 part of Venetian soap, 1-5 part salicylic acid. For red, blue or violet, 1 part of gelatine glue, 2 parts of aniline of desired color, 1 part of absolute alcohol, 10 parts of glycerine, 1 part of Venetian soap and 1-5 part of salicylic acid. The following are two additional receipts used for this purpose:

1.—Mix and dissolve 2 to 4 dr. of aniline violet, 15 oz. of alcohol, 15 oz. of glycerine. The solution is poured on the cushion, and rubbed in with a brush. The general method of preparing the pad is to swell the gelatine with cold water, then boil and add the glycerine, etc. A full description of the general method will be found under the Hektograph.

2.—Aniline violet, 90 gr.; boiling rain water, 1 oz.; to which is added a little glycerine and a small quantity of molasses. The quantities of the last two ingredients will vary with the season, but  $\frac{1}{2}$  teaspoonful will be ample for the quantities of violet and water specified.

### Stencil Ink.

1.—Take of shellac, 2 oz.; borax, 2 oz.; water, 25 oz.; gum arabic, 2 oz.; Venetian red, a sufficiency. Boil the borax, shellac, and some water, until they are dissolved; add the gum arabic, and withdraw from the fire. When the solution has become cold complete 25 oz. with water, and add more red to bring it to a suitable consistency.

2.—Mastic, in tears, 8 oz.; shellac, 12 oz.; Venice turpentine, 1 oz. Melt together, add 1 lb. of wax, 6 oz. of tallow; when dissolved, add 6 oz. of hard soap shavings (tallow soap), and mix; then add coloring matter, such as lampblack, Prussian blue, vermilion or carmine.

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### (Inks)

chrome green or white lead, or other pigment. The cake should be brittle.

3.—*Colored Stencil Ink*.—a.—Shellac, 4 parts; borax, 1 part. Dissolve in a small quantity of boiling water and dilute with hot water to the consistency of very thin syrup; to this add a sufficient quantity of logwood, or Brazil wood extract, or soluble coal-tar reds, for red. For blue, add to the lac solution soluble Prussian blue or blue carmine.

b.—*Blue Stencil Ink*.—The basis of the stencil inks commonly used varies to some extent, some preferring a mixture of pigments with oils, and others a watery shellac basis, and we give alternate formulas:

(1) The Basis.—Shellac, 2 oz.; borax, 1½ oz.; water, 10 oz. Boil together until 10 oz. of solution are obtained.

(2) The Coloring.—Prussian blue, 1 oz.; China clay, ½ oz.; powdered acacia, ½ oz. Mix thoroughly, and gradually incorporate the shellac solution.

(3) Prussian blue, 2 oz.; lampblack, 1 oz.; gum arabic, 3 oz.; glycerine, sufficient. Triturate together the dry powders and then make into a suitable paste with glycerine.

4.—*Stencil Ink for Wood*.—An excellent stencil ink for boxes and packing cases can be made by mixing lampblack, fine clay and gum arabic together. The lampblack gives the color, the clay furnishes a body, and the gum an adhesive. Water will answer as a solvent, but lampblack is so light that a few drops of vinegar or other acid will facilitate its admixture with the other ingredients. Any good adhesive substance, such as dextrine or gum tragacanth, may be found to answer as well as gum arabic to bind the mixture.

### Stone or Marble, Ink for.

Trinidad asphaltum and oil of turpentine, equal parts. This is used in a melted state for filling in letters cut on tombstones, marble slabs and monuments, and is very durable.

### Tin, Ink for Writing on.

1.—Nitric acid, 12½ parts; copper, 1¼ parts; add water, 12½ parts. Clean the tin with dry whiting; write with a quill.

2.—Mix verdigris, 1 part; sal ammoniac, 1 part; chimney black, ½ part; water, 10 parts. To be well shaken in a bottle (and labeled poison). To be used with a quill pen.

### Typewriter Ink.

1.—Transparent soap, 1 part; glycerine, 4 parts; water, 12 parts; 94% alcohol, 24 parts; aniline color, sufficient.

### (Inks)

Mix the water and glycerine, and in the mixture dissolve the soap by the aid of heat. Dissolve the color in the alcohol, and mix the two solutions. Nigrosine is recommended for black. The only objection that we have heard to this ink is that it is somewhat hygroscopic in wet weather, and has a tendency to thicken up in long continued dry weather. Castor oil has been strongly recommended as a basis for typewriter inks, stamping inks, etc., and it is claimed that inks made with it are not subject to the objections noted above, being very little affected by extreme dryness, moisture, heat or cold, etc. Any of the oil-soluble anilines will answer for a coloring agent, the copying qualities depending on the amount of color used.

2.—Blue aniline, oil-soluble, 3; oleic acid, 6; castor oil, 94. Mix the dye with the oleic acid, gradually incorporate the oil, then heat the whole to 40° C., stirring constantly all the while.

3.—Blue aniline, oil-soluble, 2.5; lemon yellow aniline, oil-soluble, 1.5; oleic acid, 5; castor oil, 95. Prepare in the same manner as the preceding aniline inks.

4.—Blue aniline, 1B, 3; distilled water, 10; wood vinegar, 10; alcohol, 70; glycerine, 70.

5.—The following dyes are dissolved in the same menstruum in the quantities indicated: Methyl violet, 3B, 2 parts; diamond fuchsin, 1, 2 parts; green aniline, D, 4 parts; vesuvine, B, 5 parts; jet black, 3 parts.

6.—*Blue-Black*.—Aniline black, oil-soluble, 5 parts; crude oleic acid, 5 parts; castor oil, q. s. to make 100 parts. Proceed as before.

7.—*Red*.—Bordeaux red, oil soluble, 15 parts; aniline red, oil-soluble, 15 parts; crude oleic acid, 45 parts; castor oil, enough to make 1,000 parts. Rub the colors up with the oleic acid, add the oil, warming the whole to 100 to 110° F. (not higher), under constant stirring. If the color is not sufficiently intense for your purposes, rub up a trifle more of it with oleic acid, and add it to the ink. By a little experimentation you can get an ink exactly to your desire in the matter.

8.—*Violet*.—Aniline violet, oil-soluble, 3 parts; crude oleic acid, 5 parts; castor oil, q. s. to make 100 parts. Mix. Proceed as in first instance. The penetration of the ink may be increased *ad libitum* by the addition of a few drops of absolute alcohol, or, better, of benzol.

### Vanadium Ink.

The following formula for a vanadium ink is said to yield a satisfactory prepa-

## Writing Materials

### (Inks)

ration: Tannin, 45 gr.; ammonium vanadate, 2 gr.; water, enough to make 1 fl.oz. Dissolve the tannin in 7 fldr. of water, the ammonium vanadate in 1 fldr. of water, and mix the two solutions. This furnishes a deep black ink, which flows freely without blotting, dries rapidly, with a brilliant gloss, and is not impaired by water. In the course of a few weeks the ink, as well as the writing, changes to a reddish yellow, remaining in this condition, unaltered by water or acids.

#### Vegetable Ink.

Experiments are being made to acclimatize in Europe the *Coriaria thymifolia*, or ink plant, of New Granada. The juice of this plant, locally termed *chanchi*, is at first of a somewhat reddish color, but becomes intensely black in a few hours. This juice can be used for writing without requiring any further preparations; it corrodes steel pens less than ordinary ink, and has, moreover, the advantage of better resisting chemical agents. When the portion of America named above was under Spanish dominion, all public documents were written with *chanchi*, which was not removed from paper by sea water.

#### Violet Ink.

1.—Methyl violet, 3B, 96 gr.; sugar, 96 gr.; oxalic acid, 20 gr.; distilled water, 19½ fl.oz. Mix the dye with 1 fl.oz. of cold water, set aside for 2 hours, then add the remainder of the water, in the hot condition, and the other ingredients, and stir about until dissolved.

2.—Digest ½ oz. of aniline violet in 1 oz. of alcohol, in a suitable vessel, as above, for 3 hours; then add 1 qt. of distilled water, and heat gently till the odor of spirit is dissipated. Then add 2 dr. of gum arabic, dissolved in ½ pt. of water, and allow the whole to settle. This will bear dilution, if desired, with an additional quantity of distilled water.

#### White Ink.

1. White ink is made by suspending some insoluble substance in a liquid and applying with a brush or pen. In this way, zinc oxide (Chinese white) may be ground very fine on a slab, with a little mucilage of tragacanth, then thinned to the required consistency to flow from a pen. The mixture requires shaking from time to time to keep the pigment from separating. The ink may be preserved by adding a little oil of cloves, carbolic acid, or other antiseptic, to prevent decomposition. All so-called white inks for colored

### (Papers)

papers are made from acids or alkalies which will discharge the color.

2.—The following preparation is used for writing on slate-colored, blue or red paper: Slaked lime, 4 dr.; tragacanth, in powder, 16 gr.; glycerine, a sufficiency; distilled water, 4 oz. The lime is rubbed with the tragacanth, and enough glycerine to make a stiff paste; rub for about 15 minutes, and then add the water, and bottle.

3.—The following is an ink for a blue paper: Hydrochloric acid, 1 fldr.; mucilage, 30 minims; water, 7 fldr.

#### Yellow Ink.

1.—Coarsely powdered gamboge, 1 oz.; hot water, 5 oz. Dissolve, and when cold add ¾ oz. of spirit.

2.—Boil ½ lb. of French berries and 1 oz. of alum in 1 qt. of rain water for half an hour, or longer, then strain, and dissolve in 1 oz. of hot liquor of gum arabic.

**Zinc, Writing on.** (See **Stamps, Ink for.**)

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**Adhesive Paper.**—Use a good quality of mucilage (see **Mucilages**), and paint the paper, which should be stretched with this, and when dry cut up for use. Paper may be gummed on both sides; affords a very convenient mode of mounting pictures, etc.

**Anti-Rust Paper for Needles, etc.**—This is paper covered with logwood, and prepared from a material to which fine graphite powder has been added, and which has been sized with glue and alum. It is used for wrapping around steel goods, such as sewing needles, etc., and protecting them against rust. According to Lake, the paper is treated with sulphuric acid, like vegetable parchment, the graphite being sprinkled on before the paper is put into the water.

**Carbon Papers.**—1.—Many copying papers act by virtue of a detachable pigment, which, when the pigmented paper is placed between two sheets of white paper, and when the uppermost paper is written on, transfers its pigment to the lower white sheet, along lines which correspond to those traced on the upper paper, and therefore gives an exact copy of them on the lower paper. If the copying paper is coated with pigment on one side only, that is naturally made the lower side. If, however, it is pigmented on both sides, it is placed between two sheets of white paper, and the sheet to be written on is placed on the top of all. Two copies are thus obtained, one of which is reversed,

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### (Papers)

but can be easily read by either of the two well-known devices. The pigments used are fine soot or ivory black, indigo carmine, ultramarine and Paris blue, or mixtures of them. The pigment is intimately mixed with grain soap and then rubbed on to thin but strong paper with a stiff brush. Fatty oils, such as linseed or castor oil, may be used, but the grain soap is preferable. Graphite is frequently used for black copying paper. It is rubbed into the paper with a cotton pad until a uniform light gray color results. All superfluous graphite is then carefully brushed off. It is often required to make a copying paper which will produce at the same time a positive copy, which is not required to be reproduced, and a negative or reversed copy from which a number of direct copies can be taken. Such paper is covered on one side with a manifold composition, and on the other with a simple copying composition, and is used between two sheets of paper with the manifold side undermost. The manifold composition is made by mixing 5 oz. of printers' ink with 40 oz. of spirits of turpentine, and then mixing it with a fused mixture of 40 oz. of tallow and 5 oz. of stearine. When the mass is homogeneous, 30 oz. of the finest powdered protoxide of iron, first mixed with 15 oz. of pyrogallie acid and 5 oz. of gallic acid, are stirred in till a perfect mixture is obtained. This mass will give at least 50 copies on damp paper, in the ordinary way. The copying composition for the other side of the prepared paper consists of the following ingredients: Printers' ink, 5 oz.; spirits of turpentine, 40 oz.; fused tallow, 30 oz.; fused wax, 3 oz.; fused rosin, 2 oz.; soot, 20 oz. It goes without saying that rollers or stones or other hard materials may be used for the purpose under consideration, as well as paper. The manifold mass may be made blue with indigotin, red with magenta, or violet with methyl violet, adding 30 oz. of the chosen dye to the above quantities of pigment. If, however, they are used, the oxide of iron and gallic acids must be replaced by 20 oz. of carbonate of magnesia.

2.—The white paper is only very fine, thin writing paper. The black is soft paper, prepared by being smeared with a composition of groase and plumbago or lamplack. This mixture is allowed to remain on for 12 hours, and the paper is then wiped smooth with a piece of wool or cotton waste. Place white paper over black, and write with a blunt point.

### (Papers)

3.—Melt 10 parts of lard, 1 part of wax, and mix with a sufficient quantity of fine lamplack. Saturate unglazed paper with this, remove excess, and press.

4.—A workable substitute for the carbon manifolding paper bought in the stationery stores may be made as follows: Lard, 12 grams; beeswax, 2 grams; lampblack, 2 grams. Melt together the lard and wax, and pour gradually into a warm mortar containing the lamplack, with constant trituration. Brush this mixture, while still liquid, over warm paper, and remove the excess with a flannel cloth.

*Chemically Prepared Paper.*—1.—(Chemically prepared paper for autographic and automatic telegraphy is prepared by soaking it in either of the following solutions: Nitrate of ammonia, 2 lb.; ferricyanide of potassium,  $\frac{1}{2}$  oz.; gum tragacanth, 2 oz.; glycerine, 2 oz.; water,  $\frac{1}{2}$  gal. Or, iodide of potassium,  $\frac{1}{4}$  lb.; bromide of potassium, 1 lb.; starch,  $\frac{1}{2}$  oz.; water, 2 qt.

2.—Iodide of potassium,  $\frac{1}{2}$  lb.; bromide of potassium, 2 lb.; dextrine or starch, 1 oz.; distilled water, 1 gal.

*Cleaning Paper.*—(See **CLEANING**.)

*Cork Paper.*—A paper under this title has been patented in the United States; it is prepared by coating one side of a thick, soft and flexible paper with a mixture composed of glue, 20 parts; gelatine, 1 part; molasses, 3 parts; and afterward covering with finely powdered cork, which is afterward lightly rolled in. This paper is largely used to pack bottles.

*Filtering Paper.*—That usually employed is blotting paper. S. H. Johnson makes a kind by mixing 5 to 20% of purified animal charcoal powder with the pulp, which is preferably long-fibred.

*Glass Paper.*—The fragments of broken wine bottles, etc., are carefully washed to remove dirt, the glass is crushed under a revolving stone, and sifted into 6 sizes, as in manufacturing emery. It is sifted through sieves of wire cloth, which are generally cylindrical, like the bolts of flour mills. The cloths have from 16 to 90 wires to the inch. A surface of thin glue is spread on the paper, and the pulverized glass dusted over it with a sieve.

*Gold Leaf.*—To attach permanently to paper or cardboard without discoloration by the adhesive striking through: Dissolve finely shredded isinglass in a little water, at moderate temperature, which must not be allowed to reach the boiling point. Add as much nitric acid by weight as of isinglass.

*Greasy Paper, To Write on.*—To 1 ox-gall add a handful of salt and  $\frac{1}{4}$  pt. of

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### (Papers)

vinegar. If the parchment or paper is greasy, add a little of this to the ink.

*Hydrographic Paper.*—A name applied to prepared paper which is written on with water, when the writing appears.

1.—Calcined sulphate of iron, 1 part, and 4 parts of nutgalls, both finely powdered, are rubbed into the paper, with pressure. Writes black with water.

2.—Use persulphate of iron and ferrocyanide of potassium in the same way as No. 1.

3.—As in the last, using copper sulphate instead of iron sulphate. Writes brown.

*Insulating Paper.*—Absorbent tissue paper is rendered insulating by steeping it in melted paraffine, and is used for the dielectric of large telegraph condensers, and Muirhead's artificial cable. An insulating varnish for paper is made by mixing 1 part of Canada balsam and 2 parts of essence of turpentine. Digest in a bottle, with gentle heat, and filter before cooling.

*Iridescent Paper.*—Gallnuts, coarsely powdered, 6¾ oz.; sulphate of iron, 4¼ oz.; sulphate of indigo, ¾ oz.; gum arabic, 18 gr. Boil these ingredients, strain through a cloth, crush the paper with the liquid, and expose to vapor of ammonia.

*Issue Paper.*—One part each of elemi, spermaceti and Venice turpentine; white wax, 2 parts. Melt them together by gentle heat, and spread the mixture on paper. Used to keep issues open.

*Luminous Paper.*—Dry thoroughly, and mix by grinding, 3 parts of gelatine, 3 parts of potassium bichromate and 37½ parts of calcium sulphide. Stir 1 part of the powder with 1½ parts of boiling water to a thickly fluid paint. Apply one or two coats with a brush to the paper or pasteboard to be made luminous.

*Mourning Stationery, Black Color for.*—In its production, add to a solution of 500 parts of gum arabic 40 parts of bichromate of potassium, and then introduce the quantity of ivory black required to produce the desired depth of color. To prevent the cracking of the mixture it may be mixed with some glycerine.

*Packing Paper.*—Packing paper may be made watertight by dissolving 1.82 lb. of white soap in 1 qt. of water, and dissolving in another quart 1.82 oz. (apothecaries' weight) of gum arabic and 5.5 oz. of glue. The two solutions are mixed and warmed, the paper is soaked in the mixture, and passed between rollers or hung up to dry.

*Painted Paper.*—Unsized paper is coated with an aqueous solution of dextrine.

### (Papers)

When this coat is dry, a layer of siccativ oil paint is applied, and the sheet so obtained may be used for packing purposes, to render fabrics impermeable to water, etc.

*Papyrus.*—Dip white unsized paper for ½ minute in strong sulphuric acid, afterward in water containing a little ammonia. Paper thus treated has, when dry, the toughness and appearance of parchment.

*Paraffine Paper.*—Dissolve paraffine in benzine, and into the warm solution dip the paper, sheet by sheet; let drip off and dry. On the large scale, it may be done by letting paper from a continuous roll pass through such a solution and then between flannel to absorb the surplus. Wax is best dissolved in carbon disulphide, and paper can thus be made ready for use in 5 minutes. Quite a good plan is to apply the benzine solution of paraffine by means of a sponge.

*Phenyl Paper.*—Used for packing meat and substances liable to decay. Fuse 12½ parts of stearic acid at a moderate heat. Mix with 5 parts of carbolic acid and 12½ parts of paraffine (melted). Stir until the mixture becomes solid. Take the paper and go over quickly with a hot iron, against which is held a piece of the mixture, which will melt and run down on the paper.

*Preserving Papers.*—1.—Butter-Preserving Paper.—Cooking salt, in fine powder, 160 gr.; saltpeter, in fine powder, 320 gr.; whites of 20 eggs. Beat the albumen to a froth, mix the salts, and add the mixture to the froth, little by little, with constant stirring, until a solution is formed. In this imbibe a good quality of bibulous paper, and hang it across strings to dry. When dry, go over each sheet with a hot smoothing iron, the face of which is kept well waxed.

2.—Salicylated Paper.—Divide any desired quantity of salicylic acid into 2 equal parts. Make a solution containing 3 parts of Glauber salt and 7 parts of borax in 58 parts of water, heat, and add one of the parts of salicylic acid. Digest the remaining half of the acid in a volume of hot glycerine about equal to that of the saline solution. Mix the two liquids, and then carefully add water until a solution of about 3% of salicylic acid is obtained. This answers for thin paper, but a thicker paper requires a 5% solution. The best paper for the purpose is one having a satin finish. If the salts show a tendency to crystallize out on the paper on drying, more glycerine is needed.

## Writing Materials

### (Papers)

Each sheet should be put in separately, and kept immersed for 4 or 5 minutes, the solution being maintained at a temperature of not less than 150° F. The paper should be dried at ordinary temperatures and kept pressed between pasteboard, or in rolls.

3.—Silverware, Paper for.—Caustic soda, 6 parts; zinc oxide, 4 parts; water, sufficient. Dissolve the caustic soda in water until a density of 20° B. is obtained (sp. gr. 1.161, to obtain which, near enough for all practical purposes, take 11 parts of sodium hydrate to every 100 parts of water), add the zinc oxide, and boil for 2 hours, if possible, under a pressure of 5 atmospheres. After cooling, thin down with water to 10° B. (sp. gr. 1.075). Proceed as in the general directions. Paper for wrapping silver should be soft and thin, so that it will cling to the surface of the article wrapped in it, without danger of scratching it. A good article of tissue paper is excellent, but the best is a Japanese fiber paper of great softness and thinness, yet very strong.

*Safety Paper.*—1.—Paper may be prepared for bank checks and other documents so that any writing in ink, once made thereon, cannot be altered without leaving plainly visible marks, by passing the sheets through a solution composed of 0.015 gr. of gallic acid to 1 gill of distilled water.

2.—Protective for Checks.—Print with a fugitive writing ink, which will be easily destroyed.

*Splitting a Sheet of Paper.* People who have not seen this done might think it impossible, yet it is not only possible, but extremely easy. Get a piece of plate glass, and place on it a sheet of paper; then let the latter be thoroughly soaked. With care and a little dexterity the sheet can be split by the top surface being removed. But the best plan is to paste a piece of cloth or very strong paper to each side of the sheet to be split. When dry, violently, and without hesitation, pull the two pieces asunder, when part of the sheet will be found to have adhered to one and part to the other. Soften the paste in water, and the pieces can be easily removed from the cloth. The process can be utilized in various ways. If it be wanted to paste in a scrapbook a newspaper article printed on both sides of the paper, and there is only one copy, it is very convenient to know how to detach the one side from the other. The paper, when split, as may be imagined,

### (Papers)

is more transparent than before, and the printing ink is somewhat duller.

*Sticking Paper.*—Brush over your sheets a solution of dextrine, with sugar mixed.

*Test Papers.*—Use good unsized paper, wet uniformly with the substance. In preparing decoctions, making solutions, etc., where water is used, only distilled water must be used.

1.—Brazil Wood.—Make from the decoction; alkalis turn it to a purple; acids, if strong, to a red.

2.—Buckthorn.—Reddened by acids.

3.—Cherry Juice.—Same as buckthorn.  
4.—Dahlia.—This very delicate test is turned green by alkalis, red by acids; caustic alkalis, yellow.

5.—Elderberry.—Same as last.

6.—Iodide of Potassium.—Make the solution in distilled water. Used in a number of ways as a test.

7.—Lead Acetate.—Make from a solution of the salt in water. Used to detect hydrogen sulphide.

8.—Mallow.—Prepare an infusion of the purple flowers of the mallow. Affected the same as the dahlia paper.

9.—Manganese.—From solution of manganous sulphate; blackened by ozone.

10.—Rhubarb.—Make a strong infusion of the powdered root. Alkalis turn it brown; boracic acid has no effect upon it.

11.—Rose.—Made from a strong infusion of the leaves of the red rose. Alkalis turn it green.

12.—Starch.—From a cold decoction of starch. Free iodine turns it blue.

13.—Sulphate of Iron.—From a solution of ferrous sulphate. Used as a test for hydrocyanic acid.

14.—Turmeric.—This is made by preparing an alcoholic tincture of turmeric root. Unsized paper may be stained with it; used in testing for alkalis.

*Waxed Paper.*—Place cartridge or other paper on a hot iron and rub it with beeswax, or brush on a solution of wax in turpentine. On a large scale, it is prepared by opening a quire of paper flat upon a table, and rapidly ironing it with a heavy, hot iron, against which is held a piece of wax, which, melting, runs down upon the paper and is absorbed by it. Any excess on the topmost layer readily penetrates to the lower ones. Such paper is useful for making waterproof and air-proof tubes, and for general wrapping purposes.



## Writing Materials

### (Pencils)

#### PENCILS. (See also Crayons.)

**Aniline.**—The materials used are aniline, graphite and kaolin, in different proportions. Made into a paste with cold water, they are pressed through a screen that divides the mass into slender sticks used in filling the pencils. When dry, the sticks are fitted to the wooden parts, and glued together in the usual way. They may be used in copying, marking in permanent color, and in reproducing writing or designs. In copying, a thin sheet of moistened paper is laid over the letter, design or document, and the lines are traced with the pencils. The action of the water on the aniline gives a deep, fast tracing, resembling ink in color. On ordinary dry paper they give a mark which cannot be removed by india-rubber. Moistened sheets of paper laid over the writing, under a slight pressure, will transfer good impressions that do not blur.

**Black Lead for.**—The successful production of pencil leads is a very valuable trade secret to the manufacturers of pencils. In a general way, it may be said that black lead for pencils is usually prepared by one or another of the following methods:

1.—The blocks of plumbago are exposed to a bright red heat in a closely covered crucible, and are afterward sawed into minute sticks and mounted in cases of cedar or satin wood.

2.—The plumbago, in powder, is calcined as before, and then mixed with an equal or any other desired proportion of pure washed clay, also in powder, after which the mixture is reduced to a plastic state with water and pressed into grooves cut on the face of a smooth board, or into well greased wooden molds, in which state it is left to dry. When dry, the pieces are tempered to any degree of hardness by exposing them, surrounded by sand or powdered charcoal, to various degrees of heat. The crucible is not opened until the whole has become cold, when the prepared "slips" are removed, and mounted as before. This method was invented by M. Conte in 1795.

3.—The dough or paste, prepared as last, is reduced to the required form by forcing it through a perforated plate (in a similar manner to that adopted for colored crayons), or into minute metallic cylinders, from which it may be readily shaken after it becomes partially dry. The leads for some varieties of drawing pencils are immersed for a minute in very hot melted wax or suet before mounting

### (Pencils)

them. To the composition for others a little lampblack is added to increase and vary the degree of blackness.

**Bronze Pencils.**—Bronze powder is thoroughly mixed with finely washed clay and dissolved gum, and to improve the hold of the stroke on the marked substance, as well as increase brilliancy, some fat is added. The formation of the mass into strips, and its subsequent treatment, is effected with the aid of machines employed in making lead pencils.

**Colored Lead Pencils.**—Faber receipt (Stein, near Nuremberg).—1.—Very Soft.—Aniline dyestuff, 50; chemically prepared graphite, 37.5; purified kaolin, 12.5.

2.—Soft.—Aniline dyestuff, 46; chemically prepared graphite, 34; purified kaolin, 20.

3.—Hard.—Aniline dyestuff, 30; chemically prepared graphite, 30; purified kaolin, 40.

4.—Very Hard.—Aniline dyestuff, 25; chemically prepared graphite, 25; purified kaolin, 50.

The materials, pulverized as finely as possible, are mixed with water into a paste, of which little sticks are formed.

**Copying Pencils.**—A mass adapted for red, yellow, blue and green copying pencils is obtained by making an intimate mixture of 1 part each of slaked lime, with 2 to 3 parts of a cochineal and borax mixture or 2 to 3 parts of logwood extract and chromate of potash or 2 to 3 parts of indigo extract, or 2 to 3 parts of fustic extract, or 2 to 3 parts of the last two mixed. To make copying pencils from such mixture, mix them with mineral wool, pulverized hard soap and a solution of oxgall and soap, and press them, according to the method practiced in manufacturing lead pencils, in molds, or through perforated plates.

**Indelible Pencils.**—1.—Reduce nitrate of silver to an impalpable powder, add just enough lampblack to give it a black color, and enough of a thick solution of gum arabic in hot water to make the powder coherent. Rub these ingredients well together, form into thin sticks, and dry.

2.—Kaolin, 8 parts; finely powdered manganese dioxide, 2 parts; silver nitrate, 3 parts. Mix, and knead intimately with 5 parts of distilled water; then dry the mass, and enclose it in wood. Transfer paper is made by rubbing white paper with a composition of 2 oz. of tallow, ¼ oz. of powdered black lead, ¼ pt. of linseed oil and sufficient lampblack to make it of the consistency of cream. These

## (Sealing Wax)

should be melted together, and rubbed, while hot, on the paper. When dry, it will be fit for use.

*Marking Linen, Pencils for.*—Mix 4 parts of powdered pyrolusite with 16 parts of thoroughly dried alumina; add to this a solution of 6 parts of nitrate of silver in 10 parts of distilled water. Rub and knead the mass thoroughly. Pencils are formed from this and dried. Used for marking linen.

## SEALING WAX

*Mixing.*—It is essential that all the ingredients be dry, and to insure this they are kept in paper bags on a shelf running around the walls of the stove room, at about 18 in. below the ceiling. The order of adding the ingredients is as follows: The rosins and turpentine are first melted together; then the neutral bodies (chalk, etc.), if any, are stirred in; next the pigments are added; and the volatile balsams and oils are only introduced at the last moment before forming. When only one pigment is used, it is simply warmed, and stirred into the mass. When a shade is to be produced by a mixture of colors, no neutral bodies are added to the rosins, but they are mixed with the colors in a china dish, warmed, and then added to the melted mass. Any required tint is obtained by mixing, and frequent testing.

*Melting.*—The melting of the mass should be conducted at the lowest possible temperature, sufficing only to keep it in a fluid state. Quantities of 20 to 25 lb. are treated at a time in a vessel large enough to permit quick stirring. Often the furnace used resembles an ordinary cook stove, the fire heating cast-iron plates; but these are objectionable from the inequality of the heating and the risk of fire. Enameled cast-iron pots are best for melting in, keeping a separate pot for each mixture. Before using a pot for a new color it must be allowed to get quite cold, when the adhering wax can be easily cleaned off. The shellac is first put into the pot and melted, while being continually stirred with a flat paddle of hard wood; the turpentine is then intimately incorporated; next follow the neutral bodies and colors, in a thin stream, with constant stirring, which is more necessary if the pigments are heavy. When the mass seems uniform, drops of it are examined by letting them fall on a cold, smooth metallic plate, when the color, hardness and fracture can be tested. When satisfactory, the heat is adjusted to maintain a fluid condition, aromatic

## (Sealing Wax)

substances are quickly stirred in, and forming is commenced.

*Forming.*—Sealing wax is molded into sticks in special forms, consisting of one piece for rectangular or triangular sticks, but must be of two for oval or round. Forms in one piece are made of rectangular brass plate, carrying grooves 1-25 in. wider at the top than at the bottom, for facilitating removal of the sticks. It is a common practice to put forms on a stove, or cool them off, while molding, by placing them on metallic trays with cold water beneath, to cool the sticks rapidly; this releases the forms more quickly, but makes the sticks brittle, and it is better to let them cool gradually on a wooden table, while if the form becomes so warm as to much protract the setting of the wax, it may be dipped in cold water and carefully dried before using again. Engraved forms are difficult to turn out, but this may be partly remedied by slightly rubbing the engraved parts with oil of turpentine. Surface ornamentation, such as gilding or silvering, is effected by placing the substances in the form. As brass forms are expensive, they are sometimes replaced by home-made ones of type metal. To produce them, a stick of fine wax is coated with a thin film of olive oil, and a cast of it is taken in plaster of paris; when this is thoroughly dry it is put into a small wooden box, and melted type metal is poured round to make a form. The forming of the wax is conducted as follows: The molten wax is ladled from the pot into a casting spoon, previously heated. By this it is poured in a uniform stream into the forms. These should be slightly warmed before the first molding takes place.

*Polishing.*—Polishing; dressing or enameling is usually applied to all grades, though the finer qualities have a lustrous surface on coming out of the form. When the improved furnace before mentioned is not in use, a special polishing stove is necessary. This consists of an iron slab covering a vault, heated by a fire beneath. The sticks are taken in the hand and held in the heat of the polishing stove till the surfaces begin to melt and the sticks bend. For gilding, silvering or bronzing, the part to be ornamented is touched with a brush dipped in 90% alcohol, and the gold or silver leaf, or bronze powder, is applied, and adheres tenaciously.

*Composition.*—The following recipes for the compounding of sealing waxes will

## Writing Materials

### (Sealing Wax)

be found to embrace all that are of general utility:

**Black.**—1.—Shellac, 15 parts; turpentine, 27 parts; pine rosin, 20 parts; chalk, 12 parts; soot, 16 parts.

**2.**—Shellac, 16 parts; turpentine, 12 parts; rosin, 12 parts; chalk, 3 parts; gypsum, 2 parts; vine black, 7 parts.

**Blue.**—Shellac, 7 parts; turpentine, 6 parts; pine rosin, 3½ parts; magnesia, 1 part; chalk, 2 parts; blue coloring matter, 2 to 2½ parts.

**Brown.**—1.—Shellac, 4 parts; turpentine, 12 parts; pine rosin, 8 parts; gypsum, 4 parts; chalk, 4 parts; umber, 4 parts. The shellac for preparing chocolate brown sealing wax must not be too dark. The product of the above recipe is dark brown, and unbleached shellac and dark rosin may be used for preparing it.

**2.**—Light Brown.—Take 7½ oz. of shellac and 4 oz. of Venice turpentine, and color with 1 oz. of brown ochre and ½ oz. of cinnabar (red sulphuret of mercury or vermilion).

**Colorless Sealing Wax.**—Beeswax, 11 parts; turpentine, 3 parts; Rhine oil, 1 part; shellac, 5 parts. Mix with heat.

**Decd.**—Light-colored rosin, 12 parts; turpentine, 7 parts; clarified tallow, 6 parts; whitening, 8 parts; minium, 6 parts.

**Diplomas, Soft Sealing Wax for.**—Yellow wax, 24 parts; turpentine, 4½ parts; olive oil, 1½ parts. After these ingredients are melted, stir in cinnabar or other coloring matter.

**Gold Sealing Wax.**—Melt cautiously 4 oz. of pure shellac in a copper vessel, at the lowest possible temperature; add 1¼ oz. of Venice turpentine, previously warmed, and stir in 3 oz. of mica spangles; pour into metallic molds, and allow it to cool.

**Green.**—Shellac, 14 parts; turpentine, 16 parts; pine rosin, 8 parts; magnesia, 3 parts; Berlin blue, 5 parts; chrome yellow, 5 parts.

**Without a Light.**—Colophony, 3 parts; rosin, 3 parts; suet, 3 parts; Venice turpentine, 4 parts; pulverized carbonate of lime, 4 parts; pulverized minium, 4 parts. Melt the first 3 ingredients together, then add the others in succession, stirring constantly till cold.

**Parcel Sealing Wax.**—1.—Shellac, 7 parts; rosin, 13 parts; turpentine, 10 parts; oil of turpentine, 1 part; chalk, 3 parts; gypsum, 2 parts; cinnabar, 5 parts.

**2.**—Shellac, 6 parts; rosin, 24 parts; turpentine, 15 parts; oil of turpentine, 1½ parts; chalk, 9 parts; gypsum, 16 parts; minium, 18 parts.

**Red.**—1.—Rosin turpentine, 1 part;

### (Slates)

rosin, 8 parts; bleached shellac, 5 parts; German vermilion, 1¼ parts; heavy spar, 10 parts; light spar, 5 parts; oil of turpentine, 1 part.

**2.**—Shellac, 24 parts; turpentine, 16 parts; cinnabar, 18 parts; oil of turpentine, 4 parts; magnesia, 6 parts.

**3.**—Shellac, 10 parts; turpentine, 6 parts; oil of turpentine, 1 part; chalk, 1 part; magnesia, 2 parts; cinnabar, 8 parts.

**4.**—Shellac, 20 parts; turpentine, 2 parts; oil of turpentine, 1 part; chalk, 3 parts; gypsum, 3 parts; magnesia, ½ part; cinnabar, 12 parts.

**Translucent.**—A beautiful variety (aventurin), which can be prepared at comparatively low cost, is obtained by stirring finely powdered mica into the melted ground mass. Gold and silver waxes are obtained by mixing finely powdered leaf metal with the melted ground mass. Ground masses for translucent wax are:

**1.**—Bleached shellac, 3 parts; viscid turpentine, 3 parts; mastic, 6 parts; chalk, 2 parts.

**2.**—Bleached shellac, 15 parts; viscid turpentine, 20 parts; mastic, 25 parts; sulphate of baryta, 15 parts; or nitrate of bismuth, 15 parts.

**3.**—Bleached shellac, 3 parts; viscid turpentine, 4 parts; mastic, 5 parts; nitrate of bismuth, 3 parts.

**White Sealing Wax.**—1.—Bleached shellac, 28 parts; Venice turpentine, 13 parts; plaster of paris, 30 parts.

**2.**—White rosin, 15 parts; gum turpentine, 4 parts; plaster of paris, 10 parts.

We think a satisfactory article could also be made by melting together white rosin, white wax and plaster of paris. The proportions could be determined by a few experiments.

### SLATE

**Artificial.**—Fine sand, 41 parts; lamp-black, 4 parts; boiled linseed or cottonseed oil, 5 parts. Boil thoroughly together. Reduce the mixture by adding spirits of turpentine, so that it may be easily applied to a thin piece of pasteboard. Give three coats, drying between each coat; finish by rubbing smooth with a piece of cotton waste soaked in spirits of turpentine. Makes excellent memorandum books, etc. Use a slate pencil.

**Blackboard or School Slating.**—The making of a good surface for drawing or writing on with chalk or crayons is not as easy as it would appear to be. The great secret of success, however, lies in avoiding grease or oil of any description

## *Writing Materials*

(Slates)	(Slates)
in preparing the lacquer. The following give good results: 1.—Shellac, 250 parts; lampblack, 25 parts; ultramarine, 40 parts; Rochelle salt in powder, 125 parts; pumice stone, 175 parts; alcohol, 2,250 parts. Dissolve the shellac in the alcohol, and mix in the solid ingredients.	2.—Shellac, 500 parts; ivory black, 250 parts; emery, in fine powder, 150 parts; ultramarine, 125 parts. Proceed as before. Wood naphtha may be used in place of alcohol as a solvent, if the rooms in which the boards are placed are left open long enough for the odor to evaporate before the classes assemble.



## **APPENDIX**



## MISCELLANEOUS FORMULAS NOT CLASSIFIED ELSEWHERE

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*Note.*—Be sure and always refer to the INDEX, as miscellaneous formulas are often classified in one of the regular chapters. This fact is readily disclosed by the index.

### Absorbent Cotton.

Boil best quality of cotton with a 5% solution of caustic soda or potash for  $\frac{1}{2}$  hour. Wash thoroughly, and press out all water as far as possible, and immerse in a 5% solution of chloride of lime (bleaching powder) for 15 or 20 minutes; wash with a little water, then with water acidulated with hydrochloric acid, then with water. Boil once more for 15 minutes with caustic soda solution, and wash with acidulated and plain water as before.

**Accidents.** (See special chapter.)

**Agriculture.** (See special chapter.)

### Albumen.

*Blood Albumen.*—Production of a light-colored product, containing globulin from blood. The blood coagulum, obtained in any manner, is extracted with ethyl alcohol, methyl alcohol, or acetone, with admixture of 0.5 to 1% of an acid, an alkali, or an alkaline carbonate, until the greater portion of the hematin and coloring constituents have been removed. A complete decoloration cannot be effected by prolonged extraction, but can be accomplished by distributing the product obtained in water and bleaching it by the addition of a suitable bleaching medium, such as chlorine, permanganate of potash, or peroxide of hydrogen. In this condition the albumen obtained can be employed for finishing tissues, for the production of coatings, or as nutriment.

*Fish Albumen.*—Hilman's process for preparing it is as follows: The crushed spawn is macerated in sufficient water to dissolve out the albumen. The albuminous water is separated by filter press, and evaporated in a vacuum pan nearly to dryness. The thickened mass is then dried on drying floors, salicylic acid, in the proportion of 1 to 20, being added as a pre-

servative. There are difficulties in the way of freeing fish albumen from accompanying substances, which reduce its value.

*Powdered Albumen.*—If blood serum, or white of egg, is exposed in thin layers, and a current of dry air passed over it, it will become a solid, transparent substance like horn. It will keep well in this state, or it may be reduced to powder, and stored in bottles. For use in photography, 3 teaspoonfuls of cold water added to every  $\frac{1}{2}$  teaspoonful of powder represent the normal consistency of egg albumen.

*Vegetable Albumen.*—It is most easily prepared from potatoes, by cutting them into slices, covering them with very dilute sulphuric acid (2%), leaving them 24 hours, then adding fresh potatoes, and repeating the operation once more, afterward neutralizing with potash and boiling. A considerable quantity of albumen is then deposited in thick white flocks. It can also be made from wheat flour and from oleaginous seeds. Kingzett's and Portheim's processes are equally applicable to gluten, the protein of worts, etc. The latter inventor takes 100 lb. of the albuminous matter, ground up and washed with water, and dissolves it in 200 to 250 lb. of water in which has been previously dissolved 4 lb. of caustic soda or potash at 194 to 212° F. (90 to 100° C.). To the solution thus prepared he adds 4% of a solution containing 40% of glycerosulphate or glycerophosphate of calcium, or 4% of a mixture of calcic chloride and an alkaline salt of citric, tartaric or metaphosphoric acid. The mixtures are "sealed" in the usual way.

### Alcohol.

Alcohol, as the term is generally understood, may signify spirits of various strengths, and we distinguish, therefore, between alcohol of 60, 70, 80%, etc., meaning that in 100 volumes of the spirit there are contained 60, 70 or 80 volumes of absolute alcohol. As used in the U. S. Pharmacopœia, the term alcohol is meant to designate that which contains 91%, by

Always consult the Index when using this book.



## Miscellaneous Formulas

### (Alcohol)

weight, of absolute alcohol and 9% of water.

**Absolute Alcohol** is alcohol without any water whatever, and, as it absorbs water from the atmosphere with great energy, it can scarcely be obtained in commerce. What is sold for absolute alcohol is rarely above 98%. Absolute alcohol has a specific gravity of 0.7939 at 60° F.

**Caustic Alcohol.**—This term is commonly applied to sodium ethylate, a product formed by the decomposition of absolute alcohol with pure metallic sodium, the chemical formula being  $C_2H_5NaO$ , or alcohol which has had one atom of its hydrogen replaced by one of sodium.

**Cologne Spirits** is the highest grade of alcohol, having been so purified as to be devoid of all color and odor.

**Deodorizing Alcohol.**—1.—Add to the barrel of alcohol 1 gal. of water saturated with chlorine gas; agitate thoroughly, let rest for 12 hours, then saturate with chalk (which, combining with the chlorine, forms chloride of lime), and distill. Filtering through animal charcoal after precipitating the chlorine with the chalk affords a very fair substitute for the redistilled alcohol. The fusel oil can be separated from alcohol, in small quantity, by adding a few drops of olive oil and thoroughly agitating in a bottle and allowing it to settle, and then decant. The olive oil combines with and retains the fusel oil.

2.—Alcohol employed in perfumery should be free from all smell of fusel or other oils. Alcohol is deodorized by distillation over permanganate of potassa. Spirits of wine, brandy and alcohol, distilled over soap, lose their empyreumatic odor and taste entirely. At about 215° F. the soap retains neither alcohol nor wood spirit. The empyreumatic oil which remains in combination with the soap which forms the residuum of the distillation is carried off at a higher temperature by the watery vapor, which is formed during a second distillation, the product of which is a soap free from empyreuma, and is fit to be used again for similar purposes. The concentration of the alcohol increases in this operation more than when the soap is not employed, because this compound retains the water, and the alcoholic vapors which pass over are more concentrated. Thirty-three pounds of soap are enough for 100 gal. of empyreumatic brandy; and direct experiment has shown that, under the most favorable circumstances, the soap can retain 20% of empyreumatic oil. The soap employed should contain no potassa; it should be hard or

### (Alcohol)

soda soap, and ought to be completely free from any excess of fatty acids or fluids, otherwise it may render the product rancid or impure. Common soap, made with soda and oleine, has satisfied all the conditions in practice. If this soap is employed, it is better to add a little soda during the first distillation.

**Denatured Alcohol.**—Alcohol which has been rendered unfit for a beverage, but which is not impaired for industrial uses. The subject is fully treated in "Industrial Alcohol, Its Manufacture and Uses," by J. K. Brachvogel, published by Messrs. Munn & Co., New York. It is the authoritative work on the subject of alcohol manufacture.

**Diluted Alcohol.**—(See *Proof Spirits*.)

**Grain Alcohol.**—The cereals contain an amylaceous (starchy) substance, which, under the influence of diastase, is converted into fermentable sugar. The following table shows the possible yields from different grains:

	Pints pure alcohol.
100 lb. rice .....	24½
" wheat .....	22½
" rye .....	19½
" barley .....	17½
" buckwheat .....	17½
" maize .....	17½
" oats .....	15½

Rice, maize, wheat, sorghum and rye are most largely used; barley and buckwheat are added in some proportions; oats are too dear to be employed for any purpose but lending an aroma to the product of other grains.

The processes necessary to prepare grain for fermentation are:

(1) Steeping in water for 30 to 40 hours, or until the grains yield readily when crushed between the fingers.

(2) Germination, or spreading the drained grain in beds on the prepared floors of a "malthouse," kept at 53½° F. (12° C.); here it heats, and soon begins to germinate ("grow out"), this operation being finished when the rootlets have attained two-thirds the length of the grains, which may require 8 to 15 days. Care is needed in regulating the temperature, and the mass wants turning every 6 to 8 hours before germination, and every 3 to 5 hours afterward, the temperature of the grain being kept at 59 to 61° F. (15 to 16° C.).

(3) Drying the germinated grain ("malt") in layers of about 12 in. in a "kiln," at a temperature commencing at 95° F. (35° C.), rising to 131 to 140°

## Miscellaneous Formulas

### (Alcohol)

F. (55 to 60° C.), and finishing at 176 to 194° F. (80 to 90° C.).

(4) Grinding more or less finely.

(5) Mashing the malt and unmalted grain with water at 95 to 100° F. (35 to 38° C.), to liberate the saccharine fermentable matters from the starch of the unmalted grain by the action of the diastase generated in the germination of the malt.

(6) Infusion of the mass by adding boiling water till the temperature reaches 140 to 158° F. (60 to 70° C.), then allowing to stand for 4 hours with the heat never below 122° F. (50° C.), to convert the liberated starch into glucose.

(7) Fermentation of the "wash," previously cooled down to 68 to 79° F. (20 to 26° C.), in covered vats, by adding about 10½ pt. of liquid or 7 lb. of dry brewer's yeast for every 250 lb. of grain used, and leaving for 4 or 5 days.

Grain alcohols are chiefly represented by gin and whisky.

The Manufacture and Denaturation of Alcohol are treated of in our Scientific American Supplement Numbers \*1603, \*1604, \*1605, 1611, 1612, \*1627, \*1628, 1636 and \*1637. (\*) Indicates illustration of distilling apparatus, etc.

*Methyl Alcohol.*—(See *Wood Spirits.*)

*Proof Spirits, or Diluted Alcohol.*—

Proof spirits are defined by the United States laws as spirit containing (in 100 volumes) 50 volumes of absolute alcohol of sp. gr. 0.7939 and 53.71 volumes of water (the apparent excess of 3.71 volumes being lost by shrinking upon mixing the alcohol and water). Its specific gravity is 0.93553 at 60° F. The government hydrometers for examining spirits are so graduated that they indicate (at 60° F.) 0 in pure water and 200 in absolute alcohol; in proof spirits they sink to 100. A spirit is said to be "10 above proof," or "110 proof," when the hydrometer indicates 110, and such spirit contains 55% of absolute alcohol. A modification of this hydrometer is the alcoholometer, which is graduated to show 0 in pure water and 100 in absolute alcohol; each division of that instrument thus indicates 1% of alcohol, and the number of the division is directly equal to the volumetric percentage of absolute alcohol in the spirit. The diluted alcohol, as the term is used in the U. S. Pharmacopia, is that containing 53%, by volume, of absolute alcohol (or about 45.5% by weight), and has a sp. gr. of 0.920.

*Purified Alcohol.*—To 1,000 c.c. of alcohol add ½ to 1 gr., or a sufficient quantity, of potassium permanganate, in

### (Alum)

coarse powder. When the color of the alcohol is dark purple, strain to remove the excess of potassium permanganate. Allow to stand for a few hours, and then filter. The filtrate should be perfectly clear and colorless. If it comes through colored, the mixture did not stand long enough, and refiltration will be necessary. The alcohol so purified could be used in making aromatic spirits of ammonia and other alkaline and alcoholic preparations, it is thought.

*Rectified Spirits* are spirits rendered purer and stronger by redistillation.

*Solid Alcohol.*—The solid alcohol latterly introduced in all sorts of forms, may be easily produced in the following manner: Heat 1 l. of denaturated alcohol (90%) in a flask of double the capacity, on the water bath to about 60° C., and then mix with 28 to 30 grams of well dried, rasped Venetian soap and 2 grams of gum lac. After repeated shaking complete dissolution will take place. The solution is put, while yet warm, into metallic vessels, closing them up at once, and allowing the mixture to cool therein. The admixture of gum lac effects a better preservation and also prevents the evaporation of the alcohol. On lighting the solid spirit the soap remains behind.

*Spirits of Wine.*—This is the stronger alcohol that is generally found in commerce, and contains about 90% of alcohol and 10% of water. It derives its name from the fact that it was first obtained from the distillation of wine. The strongest commercial alcohol is about 95%.

*Wood Spirits or Methyl Alcohol.*—A spirit obtained, among other products, from the destructive distillation of wood. It is poisonous. Valuable articles on the Production of Wood Alcohol, etc. (wood distillation) are contained in our Scientific American Supplement Numbers \*1592, 1643, 1661, 1684, \*1723, \*1724, 1736 and 1789.

### Alum, Burnt.

Heat the alum in an open vessel to 401° F., such as an enameled fryingpan. Alum, in small pieces, 184 parts. To make 100 parts. Expose the alum for several days to a temperature of about 80° C. (176° F.), until it has thoroughly effloresced. Then place it in a porcelain capsule, and gradually heat it to a temperature of 200° C. (392° F.), being careful not to allow the heat to rise above 205° C. (401° F.). Continue heating at the before mentioned temperature until the mass becomes white and porous, and weighs 100 parts. When cold, reduce it to fine pow-

## Miscellaneous Formulas

### (Antiseptics)

der, and preserve it in well stopped vessels.

#### Alum, Chrome.

A double sulphate of chromium and potash. It is obtained as a by-product in the manufacture of artificial alizarine, and is coming into use as a mordant. It is not, as some suppose, a mixture of alum and bichromate of potash.

#### Aniline, Solvent for.

In converting red aniline into a dye for staining wood, a very weak solution of alcohol is sufficient to hold the dye after it is once dissolved. In all probability, if the color is first dissolved in a small quantity of strong alcohol, and then diluted with wood spirit, the result will be the same. It has been found by experiment that a very considerable proportion of water can be added to the dye without causing the alcohol to deposit it. Glycerine can also be used for dissolving aniline. A German writer says that "the aniline colors may be made to dissolve in water by dissolving them in a solution of gelatine dissolved in acetic acid." The aniline color is added to this solution, which is made like a syrup in thickness. It is stirred until an evenly colored paste is obtained. Then the mixture is heated in a glue pot for some little time.

#### Antiseptics.

The following are practical antiseptics, which every physician can keep on hand, ready for any emergency.

**Antiseptic Pencils.**—Tannin, q. s.; alcohol, q. s., 1 part; ether, q. s., 3 parts. Make into a mass, using as an excipient the alcohol and ether, previously mixed. Roll into pencils of the desired length and thickness. Then coat with collodion, roll in pure silver leaf, and finally coat with the following solution of gelatine, and set aside to dry: Gelatine, 3ij; water, O.i. Dissolve by the aid of a gentle heat. When wanted for use, shave away a portion of the covering, dip the pencil into tepid water, and apply. According to a German authority, pencils for stopping bleeding are prepared by mixing purified alum, 480; borax, 24; oxide of zinc, 2½; thymol, 8; formaline, 4. Melting carefully in a water bath, adding some perfume, and forming mixture into pencils or cones. A very convenient way to form into pencils where you have no mold is to take a small glass tube, roll a piece of oil paper around the tube, remove the glass tube, crimp the paper tube thus formed on one end, and stand it on end

### (Aquafortis)

or in a bottle, and pour the melted solution in it and leave until cold; then remove the paper.

**Aristol.**—This is a non-toxic germicide, used as a substitute for iodoform, and is similarly employed for chronic and syphilitic and scrofulous ulcers.

**Betanaphthol.**—A solution of 1-2500 for irrigating cavities, cleansing instruments and the surgeon's hands.

**Boric Acid.**—Affords an excellent all-round dressing. A 5 to 25% solution to mucous surfaces; an ointment, 1 part to 5 parts of vaseline; a lotion of salicylic acid, and boric acid, 12 parts, to hot water, 1,000 parts, is a safe application to the bladder or cavity of the peritoneum.

**Carbolic Acid.**—In solution, 1-20 to 1-40 for sterilizing instruments or for irrigating wounds or washing sponges. There is a possibility of carbolic poisoning, and children are specially susceptible to its effects in moderate strength solution.

**Chloride of Zinc.**—A solution of gr. xxx, or xl, to the ounce of water in poisoned wounds—dissecting wounds.

**Carbolic Sublimate.**—The most convenient is to purchase tablets, the strength of which is shown, and directions for making the different strength solutions. Symptoms of poisoning must be guarded against. This is evidently the most powerful germicide, but the most dangerous.

**Cresolin.**—Used like carbolic acid, but it is non-poisonous and unirritating to the skin. It is not soluble in water.

**Peroxide of Hydrogen.**—In 15 volume solution may be used undiluted, or diluted 10%. A convenient antiseptic for sterilizing all suppurating sinuses and cavities, when once open. It may be injected or sprayed.

**Potassium Permanganate.**—Two-grain tablets are the most convenient. Used in foul wounds; various strengths; non-poisonous; and at times a tablet is made wet with water and touched to ulcers, especially abrasions of the os uteri. Used in snake bites, dog bites, and the bites of insects.

#### Aquafortis.

Aquafortis is a name originally given by the alchemists, and is dilute nitric acid.

**Simple or Single.**—Distil 2 lb. of saltpeter and 1 lb. of copperas.

**Double.**—Saltpeter, 6 lb.; copperas, 6 lb., in its usual crystallized state, together with 3 lb. calcined to redness.

**Strong.**—Copperas, calcined to whiteness, and saltpeter, of each 30 lb.; mix,

## Miscellaneous Formulas

### (Bakelite)

and distil in an iron pot with an earthenware head.

**Nitric Acid or Spirit of Niter.**—White saltpeter, 6 lb.; oil of vitriol,  $1\frac{1}{2}$  lb.; distil into  $1\frac{1}{2}$  pt. of water.

**Dilute.** Strong nitric acid, 1 oz. by measure, and water 9 oz. by measure.

**Compound.** Double aquafortis, 16 oz.; common salt, 1 dr.; distil to dryness.

### Aqua-Regia.

This is a mixture of nitric and hydrochloric acids. (Nitric acid is sometimes called spirit of niter, while hydrochloric acid is often called muriatic acid, or spirits of salts.) The name aqua-regia was given by the alchemists, owing to the power this mixture has of dissolving gold, platinum, etc., which neither of the two acids named will do separately.

1.—Distil together 16 oz. of nitric acid with 4 oz. of common salt.

2.—Mix together equal parts of nitric acid and hydrochloric acid.

3.—Nitric acid, 1 part, and hydrochloric acid, 2 parts.

Of the above, 3 is the most effective.

### Artists' Materials. (See special chapter.)

**Asbestos:** Its mining, chemistry, manufacture, uses, etc.; is treated of in our Scientific American Supplement, Nos. 3396, 485, 650 and 1656.

### Asbestos, Acid-Resisting.

F. Schrader, in *Chemiker Zeitung*, 1897, 285, states that asbestos fabrics, to resist acids, such as are required in the chemical industry, should be made of horn-blende asbestos, in which the proportion of bases to silica is as 1:1, or of the formula  $RSiO_3$  (R being mostly magnesia). Asbestos of the composition 3:2—that is to say, serpentine asbestos—is attacked by very weak acids, like acetic acid.

### Asphaltum Liquid.

1.—Scio turpentine, 2 oz.; melt; add asphaltum, in powder, 1 oz.; mix, cool a little, and reduce with hot oil of turpentine.

2.—Asphaltum,  $\frac{1}{2}$  lb.; melt; add of hot balsam of copaiba, 1 lb.; and when mixed, thin with hot oil of turpentine. Both are used as black japan or varnish and as a glazing color by artists.

### Bakelite.

This composition is insoluble, infusible, is unaffected by most chemicals, and is an excellent insulator for heat and electric-

### (Battery Preparations)

ity. See our Scientific American Supplement Numbers 1768, 1769, 1774 and 1775.

### Barometers, Paper.

Some hygrometers are not mechanical; they owe their hygroscopic properties to their color, which changes with the state of humidity of the air by reason of the application of sympathetic inks. These instruments are often composed of a flower or a figure, of light muslin or paper, immersed in one of the following solutions:

1.—Cobalt chloride, 1 part; gelatine, 10 parts; water, 100 parts. The normal coloring is pink; this color changes into violet in medium humid weather, and into blue in very dry weather.

2.—Cupric chloride, 1 part; gelatine, 10 parts; water, 100 parts. The color is yellow in dry weather.

3.—Cobalt chloride, 1 part; gelatine, 20 parts; nickel oxide, 75 parts; cupric chloride, 25 parts; water, 200 parts. The color is green in dry weather.

### Battery Preparations.

**Bichromate Batteries, Trouve's Solution for.**—The proportional parts by weight are: Bichromate of potash, 1; sulphuric acid, 3; water, 6.6. To charge 1 gal. of water, according to M. Trouve's method, dissolve in it 21 oz. ( $1\frac{1}{2}$  lb.) of bichromate of potash, and then add, slowly, 72 oz. (9 lb.) of sulphuric acid, bearing in mind that 8 fl.oz. equal 1 lb., not 16, as in dry measure.

**Carbon, To Cut.**—Gas carbon can be cut with an old saw and a large expenditure of labor and patience. Fix the carbon in a vise, keep it moist with water, and saw away. You may use a strip of sheet iron, or of iron hoop held in a frame, like a hack saw, or a revolving disk of the same metal, instead of a saw, and in this case employ wet sand in the cut as an auxiliary.

**Carbon, Molding.**—As carbon cannot be melted to a fluid condition, it cannot be cast in a mold; but powdered carbon can be combined with a cementing substance, made into a stiff paste, then molded to shape and baked. If the grain of the article is to be close and hard, the carbon must be ground to a very fine powder. It may then be made into a paste by adding sugar syrup or treacle. This paste is next pressed into a strong iron mold, so made as to be easily taken apart afterward for the removal of the carbon article. The mold, with its carbon, must then be baked at a strong, bright-red heat, which will carbonize the sugar, and oc-

## Miscellaneous Formulas

### (Battery Preparations)

ment the powdered carbon. It may be necessary to soak the carbon again in sugar syrup, and rebake until sufficiently smooth and hard.

**Carbon, Plastic, for Batteries.**—Good coke is ground, and mixed with coal tar to a stiff dough, and pressed into molds made of iron and brass. After drying for a few days in a closed place, it is heated in a furnace, where it is protected from the direct flames, and burned, feebly at first, then strongly, the fire being gradually raised to white heat, which is maintained for 6 to 8 hours. The fire is then permitted to slowly go down, and when perfectly cold the carbon is taken out of the furnace.

**Carbon Rods and Plates.**—Carbon rods and plates of the finest quality can be made economically only by the use of expensive machinery and apparatus, such as pulverizing mills, hydraulic presses, and retorts or ovens; but the amateur, without a great deal of trouble, and with very little expense, can make carbon plates and rods which will answer a good purpose. The materials required are wheat, coke flour, molasses or syrup, and water. The tools consist of a few molds, a trowel or its equivalent, for forcing the carbon mixture into flat molds, tubes to be used as molds for carbon rods, and ramrods for condensing the material in the tubes and forcing it out, and an iron mortar, or some other device, for reducing the coke to powder. Clean pieces of coke should be selected for this purpose, and such as contain no volatile matters are preferred. The coke is pulverized and passed through a fine sieve. It is then thoroughly mixed with one-sixth to one-eighth its bulk of wheat flour, both being in a dry state. The mixture is moistened with water (or water with a small percentage of molasses added) sufficiently to render it thoroughly damp throughout, but not wet. It should now be allowed to stand for 2 or 3 hours in a closed vessel, to prevent the evaporation of the water. At the end of this time the mixture may be pressed into molds of any desired form, then removed from the molds, and dried, slowly at first, afterward rapidly, in an ordinary oven, at a high temperature. When the plates or rods thus formed are thoroughly dried they are packed in an iron box, or, if they are small, in a crucible, and completely surrounded by coke dust to exclude air and to prevent the combustion of the plates or rods during the carbonizing process. The box or crucible must be closed by a non-combustible cover, and placed in a furnace or range fire in such

### (Battery Preparations)

a way as to cause it to be heated gradually to a red heat. After the box becomes heated to the required degree, it is maintained at that temperature for an hour or so, after which it is removed from the fire and allowed to cool before being opened. The rods or plates are then boiled for half an hour in this syrup, or in molasses diluted with a little water. They are again baked in an ordinary oven, and afterward carbonized in the manner already described. This latter process of boiling in syrup and recarbonizing is repeated until the required density is secured. As some gases are given off during carbonization, it is necessary to leave the box or crucible unsealed to allow these gases to escape.

**Dry Cells.**—1.—The Burnley cell has a zinc cylinder lined with a plastic exciting mass made of sal ammoniac, 1 part; zinc chloride, 1 part; plaster of paris, 3 parts; flour, 1 part; water, 2 parts. In the center of the cell a carbon core is placed, the space between it and the exciting mass being filled with manganese peroxide, 3 parts; sal ammoniac, 1 part; zinc chloride, 1-10 part; powdered charcoal,  $3\frac{1}{2}$  parts; water, sufficient. The manganese oxide and charcoal play the part of a depolarizing agent.

2.—Obach's cell (patent 6,565 of 1893) is formed of an outer cylinder of zinc, cemented to an insulating base composed of asphalt, 70 to 80 parts; paper pulp, 10 to 15 parts; rosin, 10 to 15 parts. A smaller cylinder of depolarizing paste, with the carbon rod in the center, is put inside the zinc cylinder, the space between the two cylinders being filled with exciting mixture. The composition of the depolarizing paste is: Manganese peroxide, 50 to 60 parts; plumbago, 40 to 50 parts; tragacanth, 1 part. The exciting mixture is: Plaster of paris, 80 to 90 parts; flour, 10 to 20 parts. Made into a thin paste with a solution of sal ammoniac. The cells are covered with granular cork or an equivalent, to prevent escape of moisture, and a bitumen seal. One terminal is soldered to the zinc, and the other to the carbon, by means of an alloy of bismuth, 2 parts; lead, 2 parts; tin, 1 part; which expands on soldering, and insures good contact. The patents for the Burnley and Obach cells are in force.

3.—In the Helleisen cell, the patent for which has expired, superoxide of lead, oxide of iron, or superoxide of manganese, is used for surrounding the cathode, the powder being packed around it with slight pressure, and held there by means of fab-

## Miscellaneous Formulas

### (Battery Preparations)

ric, a porous cell, or parchment paper. The powder, the inventor states, can be advantageously mixed with such things as charcoal, graphite and copper filings; and when saline solutions are used, an acetate, free ammonia, or sal ammoniac, prevents crystallization of the zinc compounds.

**Fluids for Batteries.**—1.—Potash bichromate, 2 oz.; sulphuric acid, 3 fl.oz.; water, 16 fl.oz. Dissolve the potash in the water and add the acid.

2.—Potash bichromate, 2 oz.; sulphuric acid, 3 fl.oz.; water, 16 fl.oz.; mercury bisulphate, 2 dr. Mix as above.

3.—Commercial chromic acid, 16 oz.; sulphuric acid, 10 fl.oz.; water, 120 fl.oz. Dissolve the chromic acid in the water and add the sulphuric acid.

4.—Soda bichromate, 2 oz.; sulphuric acid, 3 fl.oz.; water, 16 fl.oz. Mix as above.

5.—Mercury bisulphate, 120 gr.; potassium bichromate,  $2\frac{1}{4}$  oz.; commercial sulphuric acid, 3 fl.oz.; water, 16 fl.oz. In the water first dissolve the mercury bisulphate and then the bichromate; then add the sulphuric acid very carefully, stirring constantly with a glass rod. When cool, the solution is ready for use. The mercury keeps the zinc well amalgamated. Sometimes the mercury salt is omitted, and frequently sodium bichromate is substituted for the potassium bichromate.

**Pole-Indicating Paper, Electric.**—Dissolve 1 to 2 grams of phenolphthalein in 10 c.c. of alcohol of 90%; add 110 c.c. of distilled water, and impregnate porous paper (blotting paper) with the milky solution. While the paper is still moist draw it through a solution of 20 grams of sodium sulphate in 100 c.c. of distilled water. Dry at moderate heat, and cut paper into narrow strips. For use, moisten the paper, and place ends of wire on it, at a distance of about  $\frac{1}{4}$  in. to  $\frac{1}{2}$  in. A red spot or strip will then appear at once at the negative pole.

**Zincs, Amalgamation of.**—This is accomplished in several ways:

1.—By dipping the zinc in dilute sulphuric acid and then dipping the end of it into a small quantity of mercury, after rubbing the surface with a brush.

2.—Dissolve 1 lb. of mercury in 5 lb. of nitromuriatic acid (nitric acid, 1 part; muriatic acid, 3 parts), heat the solution gently to hasten the action. When a complete solution of the mercury is effected, add 5 lb. more of nitro-muriatic acid. The solution should be applied with a brush, as immersing the zinc in it is wasteful.

3.—To the bichromate solution com-

### (Benzine)

monly used in batteries add to every pint of solution 1 dr. of bisulphate of mercury, or a similar amount of nitrate of mercury (mercury dissolved in nitric acid). By employing this method the amalgamation of the zincs is maintained continuously after the first amalgamation, which must be accomplished by methods 1 or 2.

4.—In the Bunsen, Grove or Fuller battery the amalgamation may be accomplished by placing a small quantity of mercury in the cells containing the zincs.

5.—Place a little mercury in a saucer with some dilute sulphuric acid. Dip the zincs into dilute acid. Then with a little strip of zinc or galvanized iron touch the mercury under the acid, and rub it on the zinc. This will transfer a little to the surface, and a few minutes' rubbing will make the zincs as bright as silver. A very small globule of mercury is enough for a single plate.

### Benzine.

An ethereal hydrocarbon, obtained in many ways, principally from the distillation of petroleum. It is very useful in the arts as a solvent and for the removal of grease spots, etc.

**To Decolorize Benzine.**—1.—Shake repeatedly with fresh portions of metallic quicksilver. Let it stand for 2 days, then rectify, or shake with plumbate of soda (oxide of lead dissolved in caustic soda), then rectify.

2.—Digest litharge in a strong solution of soda, and shake the benzine up with this.

3.—The *Scientific American* states that the disagreeable odor of benzine can be removed by shaking repeatedly with plumbate of soda, made by dissolving oxide of lead in caustic soda, and rectifying. Simply shaking with charcoal, and filtering, will partially remove the odor.

4.—To 1,750 parts of water add 250 parts of sulphuric acid, and when it has cooled down add 30 parts of potassium permanganate and let dissolve; add this solution to 4,500 parts of benzine, stir well together, and set aside for 24 hours. Now decant the benzine, and to it add a solution of  $7\frac{1}{2}$  parts of potassium permanganate and 15 parts of sodium hydrate, in 1,000 parts of water, and agitate the substances well together. Let stand until the benzine separates, then draw off.

5.—Dissolve 3 parts of litharge and 18 parts of sodium hydrate in 40 parts of water; add this to 200 to 250 parts of benzine, and agitate well together for 2

## Miscellaneous Formulas

### (Benzine)

minutes; then let settle, and draw off the benzine. Rinse the latter by agitating it with plenty of clear water, let settle, draw off the benzine, and, if necessary, repeat the operation. Either process requires considerable work, and unless large quantities of benzine are used it will be found a good deal more profitable to buy the commercial deodorized article.

6. Benzine, 7 gal.; fusel oil, 3 gal.; shake, and set to one side. This becomes milky, but clears in a day or so. To each barrel of benzine add 1 tablespoonful of powdered fresh chloride of lime, and shake gently. Now add acetic acid, 1 oz.; water, 1 oz. Mix together; roll barrel; next day add 2 qt. of benzine and fusel oil mixture.

7. Remove the bung from a barrel and put in 1 tablespoonful or so of sharp chloride of lime and a like amount of vinegar or acetic acid. Shake the barrel occasionally, and in 36 hours or so the contents are well deodorized.

8. Benzine, 20 oz.; oil of lavender, 1 fldr.; potassium dichromate, 1 oz.; sulphuric acid, 1 fldz.; water, 20 fldz. Dissolve the dichromate in the water, add the acid, and, when the solution is cold, the benzine. Shake every hour during the day, allow to stand all night, decant the benzine, wash with 1 pt. of water, and again decant; then add the oil of lavender.

9. Perfumes for Deodorized Benzol.—a. Oil of lavender, 1 fldr. to 1 pt.

b. Coumarine, 2 gr.; vanilline, 2 gr.; heliotropine, 1 gr.; absolute alcohol, 1 fldr. to each pint.

10.—Odorless Benzoline.—Petroleum spirit, 50 gal.; cotton oil, 5 gal. Mix well, and distil at a low heat till 45 to 48 gal. come over. Put by for use. Distil over the remaining few gallons, which will have more odor with them, and use for common purposes. Use the cotton oil for soap making or mixing with paraffine mixtures. This gives an almost odorless spirit benzine or benzoline, as the case may be, which may be used for any purpose to which benzine or benzoline is applicable—cleaning clothes, gloves, making hair regenerators, adulterating turpentine, thinning paints and varnishes, etc. This method is very successful, the smell being absorbed by the cotton oil, and not reappearing again to any greatly appreciable extent in the spirit. To be on the safe side, it should be used as nearly cold as possible, as under some conditions of heating it evolves its peculiar scent.

*Gelatinized Benzine.*—Boiling water, 4 oz.; coconut-oil soap, 4 dr. Dissolve,

### (Boilers)

and when cool add ether and ammonia water, each 2 dr.; glycerine, 1 dr. Mix the two solutions, and to 10 drops of the mixture in a bottle add about  $\frac{1}{2}$  dr. of benzine, and shake until it gelatinizes. More benzine is gradually added, with constant shaking, until the mixture soon assumes the appearance of boiled starch.

*Green, To Color Benzine.*—Probably the simplest and cheapest, as well as the best method of coloring benzine green is to dissolve in it sufficient oil-soluble aniline green of the desired tint to give the desired shade. As regards "the addition of poisonous substances" to benzine to make it serve as a "bug killer," the pure benzine is deadly to every insect it touches. The writer has used it, in the form of a spray, for a number of years as a cockroach and bedbug exterminator, and no more instantaneously deadly agent could be imagined.

*Inflammability of Benzine, The Prevention of the.*—Brodthmann says that he prepared mixtures of benzine and carbon tetrachloride in various proportions of volume, and found that a mixture of 7 volumes of tetrachloride and 3 volumes of benzine was still inflammable upon the approach of a match. The liquid burned with a strongly shooting flame under development of hydrochloric acid fumes. Only when the proportion reached that of 9 parts of tetrachloride to 1 part of benzine did the liquid require heating to inflame, but the flame soon became extinguished by itself.

### Bladders, To Prepare.

Soak them for 24 hours in water to which a little chloride of lime or potassa has been added, then remove the extraneous membranes, well wash them in clean water, and dry them.

*Bluing.* See *CLEANSING (Laundry)*.

### Boilers.

*Boiler Covering.*—The following table gives the results of a series of experiments by Mr. C. E. Emery for the New York Steam Company:

Material.	Non-conductivity, per cent.
Hair felt.....	100
Mineral wool No. 2.....	83.2
Mineral wool No. 2 and tar.....	71
Sawdust.....	68
Mineral wool No. 1.....	67.6
Charcoal.....	63.2
Pine wood, across grain.....	55.3
Loam.....	55
Glassworks lime, slaked.....	48

## Miscellaneous Formulas

(Boilers)	Non- conductivity, per cent.
Material.	
Asbestos .....	36.3
Coal ashes .....	34.5
Fuel coke .....	27.7
Air space, 2 in. deep .....	13.6

*Non-conducting Coverings for Steam Pipes.*—We give the following tests of Mr. G. B. Dumford, of Hamilton, Ont. These may be found superior in some cases to tests of Mr. C. E. Emery:

	Per cent.
Combination of asbestos, hair felt, air space and wood .....	100
Asbestos and hair felt and chopped straw, the straw mixed with lime putty .....	87
A plastic cement manufactured by parties at Troy, N. Y., with $\frac{1}{2}$ in. hair felt outside .....	86.6
Paper pulp mixed with lime putty, 1 in. covered with sheeting of wood pulp .....	85
Mineral wool cased with wood .....	81
Mineral wool cased with sheet iron .....	79
Charcoal .....	60
Sawdust .....	41
Loam and chopped straw sealed with wood .....	32
Asbestos .....	29
Coal ashes .....	24
Air space .....	20
Fire brick .....	15
Red brick .....	12
Sand .....	9.3

*Incrustation of Boilers, Remedies for.*—Remedies that have been adopted with more or less success for boiler incrustation:

- 1.—Potatoes, 1-50 weight of water, prevent adherence of scale.
- 2.—Salt, 12 parts; caustic soda, 2½ parts; extract of oak bark, ¼ part; potash, ½ part.
- 3.—Pieces of oak wood suspended in boiler, and renewed monthly, prevent deposit.
- 4.—Muriate of ammonia, 2 oz., in boiler, twice a week, prevents incrustation and decomposes scale.
- 5.—Coating of blacklead, 3 parts; talow, 18 parts; applied hot to the inside of a boiler every few weeks, prevents scale.
- 6.—Molasses, 13 lb., fed occasionally into an 8 horse boiler, prevented incrustation for 6 months.
- 7.—Mahogany or oak sawdust, in limited quantities. The tannic acid attacks the iron, and should, therefore, be used with caution.

(Boilers)

8.—Slippery elm bark has been used with some success.

- 9.—Carbonate of soda.
- 10.—Chloride of tin.
- 11.—Spent tanners' bark.
- 12.—Frequent blowing off.
- 13.—Paraffine oil has been used with excellent results in locomotive boilers.

14.—Marine boilers are sometimes protected from corrosion by a very thin wash of Portland cement inside.

15.—M. E. Asselin, of Paris, recommends the use of glycerine to prevent incrustation in steam boilers. It increases the solubility of combinations of lime, and especially of the sulphate. It forms with these combinations soluble compounds. When the quantity of lime becomes so great that it can no longer be dissolved, nor from soluble combinations, it is deposited in a gelatinous substance, which never adheres to the surface of the iron plates. The gelatinous substances thus formed are not carried with the steam into the cylinder of the engine. M. Asselin advises the employment of 1 lb. of glycerine for every 300 or 400 lb. of coal burnt.

16.—For a 5-hp. boiler, fed with water, which contains calcic sulphate, take catechu, 2 lb.; dextrine, 1 lb.; crystallized soda, 2 lb.; potash, ½ lb.; cane sugar, ½ lb.; alum, ½ lb.; gum arabic, ½ lb.

17.—For a boiler of the same size, fed with water which contains lime: Turmeric, 2 lb.; dextrine, 1 lb.; sodium bicarbonate, 2 lb.; potash, ½ lb.; molasses, ½ lb.; alum, ½ lb.

18.—For a boiler of the same size, fed with water which contains iron: Gamboge, 2 lb.; soda, 2 lb.; dextrine, 1 lb.; potash, ½ lb.; sugar, ½ lb.; alum, ½ lb.; gum arabic, ½ lb.

19.—For a boiler of the same size fed with sea water: Catechu, 2 lb.; Glauber's salt, 2 lb.; dextrine, 2 lb.; alum, ½ lb.; gum arabic, ½ lb.

20.—Boiler Incrustations, To Prevent. —For boilers of 100 hp., fed with river water, use the following, which should be renewed whenever the boiler is emptied: Crystallized soda, 18 lb.; dextrine, 18 lb.; alum, 6 lb.; sugar, 6 lb.; potash, 3 lb.

21.—For the same sized boiler, fed with sea water: Soda, 24 lb.; dextrine, 24 lb.; sugar, 12 lb.; alum, 3 lb.; potash, 3 lb.

When these preparations are used add 1 qt. of water, and in ordinary cases charge the boiler every month, but if the incrustation is very bad charge every two weeks.

Boiler Incrustation, Corrosion, Scale, etc., and the Use of Compounds and Sol-



## Miscellaneous Formulas

### (Brickwork)

vents for the Prevention of Same: See the Scientific American Supplement Numbers 1108, 1381, 1549, 1567 and 1790.

### Bones and Ivory, To Clean and Prepare.

1.—The curators of the anatomical museum of the Jardin des Plantes have found that the spirits of turpentine is very efficacious in removing the disagreeable odor and fatty emanations of bones or ivory, while it leaves them beautifully bleached. The articles should be exposed in the fluid for 3 or 4 days in the sun, or a little longer if in the shade. They should rest upon strips of zinc, so as to be a fraction of an inch above the bottom of the glass vessel employed. The turpentine acts as an oxidizing agent, and the product of the combustion is an acid liquor, which sinks to the bottom, and strongly attacks the ivory if allowed to touch it.

2.—Make a thick paste of common whiting in a saucer. Brush well with a toothbrush into the carved work. Brush well out with plenty of clean water. Dry gently near the fire. Finish with a clean, dry, hard brush, adding one or two drops (not more) of alcohol.

3.—Mix about a tablespoonful of oxalic acid in  $\frac{1}{2}$  pt. of boiling water. Wet the ivory over first with water, then with a toothbrush apply the acid, doing one side at a time, and rinsing, and finally drying it in a cloth before the fire, but not too close.

### Bows, Violin, Rosin for.

1.—For violin rosin, boil down Venice turpentine with a little water until a drop, cooled on a piece of glass, is of proper consistency. During the boiling, cold water must be added from time to time. When sufficiently thick, pour into cold water, knead well, and when cold break into pieces. Expose to sun until dry and transparent.

2.—Select the best clear brown rosin, melt it in a clean basin, to merely a boil, which will clear it of turpentine or other volatile oils. Pour in paper molds.

### Brickwork, Efflorescence on.

This white coating, which is such a disfigurement, can usually be prevented by adding oil to the mortar at the rate of 1 gal. to the cask of lime. Linseed oil, or any oil not saline, will do. If cement is used, an extra gallon of oil must be used. When incrustations are once formed nothing can be done except to wash with dilute hydrochloric acid.

### (Camphor)

### Calcium Sulphide.

1.—*Canton's Phosphorus*.—Calcine clean oyster shells to whiteness in a crucible, separate the clearer portions, reduce these to a fine powder, and place in layers with intermediate layers of flowers of sulphur in a crucible, cover, and heat to dull redness for about half an hour. Cover the crucible tightly, and let the mixture cool slowly in the crucible. Another method of preparing this phosphorescent sulphide is to heat bisulphide of lime—obtained by boiling lime in a little water with twice its weight of sulphur—in a covered crucible at a low red heat for one hour.

2.—*Calcium and Antimony Sulphides*.—Calcined oyster shells, 3 parts; flowers of sulphur, 10 parts; antimonious acid, 1 part. Mix intimately in fine powder, and heat for half an hour in a covered crucible at low redness.

3.—Calcium sulphide, as used in the manufacture of luminous paint, may be prepared upon the small scale by the following process: Boil for one hour  $2\frac{1}{4}$  oz. of caustic lime, recently prepared by calcining clean white shells at a strop red heat, with 1 oz. of sulphur and 1 qt. of soft water. Set aside in a covered vessel for a few days, then pour off the liquid, collect the clear orange-colored crystals which have deposited, and let them drain and dry on bibulous paper. Place the dried sulphide in a clean graphite crucible provided with a cover. Heat for  $\frac{1}{2}$  hour at a temperature just short of redness, then quickly for about 15 minutes at a white heat. Remove cover, and pack in clay until perfectly cold. A small quantity of pure calcium fluoride is added to the sulphide before heating it. It may be mixed with alcoholic copal varnish. Sulphides of barium and strontium also give phosphorescent powders when duly heated. Each sulphide has a predominant color, but the temperature to which it is heated has a modifying effect on the color. Calcine in a covered crucible, along with powdered charcoal, sulphate of lime, sulphate of barytes, or sulphate of strontia; there is produced in each case a grayish-white powder, which, after exposure to strong light (either sunlight or magnesium light), will be phosphorescent, the color depending on the sulphate used and the degree of heat employed.

### Camphor.

A concrete essential oil obtained from distillation from the camphor laurel of China. It is crystalline in form, though

## Miscellaneous Formulas

### (Carbolineum)

it is also obtained in a liquid form from Borneo.

**Facitious.**—Pass dry hydrochloric acid gas through pure oil of turpentine, cooled by a freezing mixture. A white crystalline mass is soon formed, which is dried between blotters, and purified by solution in alcohol.

**Naphthaline.**—Melt on a steam bath 100 parts of camphor and 300 parts of naphthaline, and pour into molds. If a perfumed preparation is desired, add 0.2 part of coumarine, 0.2 part of neroline, and 1 part of nitrobenzol.

**Powdering.**—According to *The Pharmacist*, the most efficient substance to keep camphor in a finely divided condition is glycerine: Camphor, 6 oz.; alcohol, 5 fl.dr.; glycerine, 1 fl.dr. Mix the glycerine with the alcohol, and triturate it with the camphor until reduced to a fine powder.

**Powdered Camphor in Permanent Form.**—1.—Powder the camphor in the usual manner, with the addition of a little alcohol. When it has nearly reduced to the proper degree of fineness add a few drops of fluid petrolatum, and immediately triturate again. In this manner a powder as fine as flour is obtained, which does not cake together. This powdered camphor may be used for all purposes except for solution in alcohol, as it will impart to the latter a faint opalescence, owing to the insolubility of the petrolatum.

2.—A similar method, recommended some years ago by John K. Williams, an English pharmacist, consists in taking equal parts of stronger ether and alcohol to reduce the camphor to powder, the claim for this method being that it only takes one-half of the time required when alcohol alone is used, and the camphor dries quicker. Before sifting add 1% of white vaseline and 5% of sugar of milk. Triturate fairly dry, spread out in the air, say 15 minutes, then pass through a moderately fine wire sieve, using a stubby shaving brush to assist in working it through.

The manufacturer of Camphor is contained in our Scientific American Supplement Nos. 852, 908 and 1455. Synthetic Camphor 1669 and 1817.

**Candles.** (See Chapter on SOAPS AND CANDLES.)

### Carbolineum.

1.—Raw, light coal tar, 95 parts, heated with 5 parts of asphalt (from coal tar) and thoroughly mixed. The coal-

### (Chalk)

tar oil may also be replaced with wood-tar oil.

2.—Heavy coal-tar oil, 1 part; light, raw wood-tar oil, 2 parts; heavy rosin oil,  $\frac{1}{4}$  part. The coal-tar and wood-tar oils must be freed from carbolic acid and creosote, which is to be effected by washing with caustic lye, and distillation.

3.—Light wood tar is mixed with some crude carbolic acid.

5.—Sodium hydrate, 100 grams; borax, 200 grams; carbolic acid, 400 grams; shellac, dissolved in alcohol, 300 grams; boiling water, 8,000 grams. An excellent wood preservative.

### Casein.

This substance constitutes the chief nitrogenized substance in milk. It is used occasionally in the arts, as for the manufacture of case in cements.

The making, uses, etc. of Caseine are treated of in our Scientific American Supplement No. 1649.

(See CEMENTS, PAINTS, VARNISHES, etc. Also consult the INDEX.)

### Catgut Manufacture

Is treated of in our Scientific American Supplement No. 1717.

**Cements.** (See special chapter.)

### Chalk for Tailors' Use.

Knead together ordinary pipeclay, moistened, and ultramarine for blue, finely ground ochre for yellow, burnt ochre for red, etc., until they are uniformly mixed; roll out into thin sheets, cut, and press into wooden or metallic molds, well oiled to prevent sticking, and allow to dry slowly at ordinary temperature, or at a very gentle heat.

### Chalk, Precipitated.

This is prepared by adding a solution of carbonate of soda to a solution of chloride of calcium (both cold), as long as a precipitate forms. This last is well washed with pure water, and dried out of the dust, as the last. The refuse, "sulphate of lime" of the soda water makers, which is poisonous in quantity, is often sold for it by the druggists. Pure chalk is wholly soluble in vinegar, and in dilute acetic, hydrochloric and nitric acids, with effervescence. Sulphate of lime is insoluble in these menstrua.

**Prepared Chalk.**—Syn. Creta. Rub 1 lb. of chalk with sufficient water, added gradually, until reduced to a very fine powder; then put this into a large vessel with water, agitate well, and, after a short interval, pour off the supernatant water, still turbid, into another vessel, and let the suspended powder subside. In

## Miscellaneous Formulas

### (Compositions)

the same way, shells are prepared, after being first freed from impurities and washed with boiling water.

#### Charcoal, How to Make.

To make charcoal readily on a small scale, place small pieces of wood in a clay crucible, cover it with wet clay, and heat in an ordinary fire for about an hour; thus all the volatile matter is driven off, and on cooling the charcoal will be found in the crucible. On the large scale, charcoal is made by burning wood in large heaps or piles, covered with earth or clay, or in ovens or kilns to which only a limited supply of air is allowed access. Any kind of wood may be used, but the hard woods, such as oak, beech and fir, produce the best and densest charcoal. Charcoal is also produced by heating wood in iron retorts, the volatile products, such as wood tar, creosote and acetic or pyroligneous acid, being condensed in receivers, and utilized.

**Chewing Gum.** (See ICE CREAMS, ETC.)

**Cleansing.** (See special chapter.)

**Colored Fires.** (See Pyrotechny below.)

**Coloring of Metals.** (See special chapter.)

#### Compositions.

*Alcarescus, Composition for.*—1.—Sandy marl, 2 parts; brine, q. s.; and knead in common salt, in fine powder, 1 part. Bake the pieces slowly and lightly.

2.—Good clay, 2 parts; fine siliceous sand, 3 parts; brine, q. s.; common salt, 1 to 2 parts, as before. Avoid overfiring.

*Asbestos Mass, Mouldable and Plastic.*—The asbestos is reduced to a powder, from which, by an admixture of water, a uniform mixture is produced; then, while stirring, more water is added, so that a paste is formed, which is allowed to stiffen by drying until the mixture attains the required plasticity. Out of this mass objects may be formed, especially filter material for the filtration of wine, vinegar, acids, and other fluids, which, after being dried for a time, can be burned out in a furnace.

*Billiard Ball Composition.*—Set 80 parts, by weight, of bone gelatine (Russian glue) and 10 parts of Cologne glue to steep with 110% of water. Heat it in a water bath and add 5,000 parts of heavy spar, 4,000 parts of chalk, and 1,000 parts of boiled linseed oil. Small rods, formed from the same material, are dipped into the mixture, and the quantity that remains attached to the rod is allowed to dry; the dripping and drying is repeated until finally a rough shaped

### (Compositions)

ball is obtained. When, after 3 or 4 months, it is dry, after being properly turned off, it is placed in a bath of red liquor for an hour, allowed to dry, and polished again, like an ivory ball.

*Carton Pierre.* (See CARTON PIERRE, in INDEX.)

*Castings, Composition to Fill Holes in.*—1.—Dry clay, 6 parts; borax in solution, 1½ parts. Mix.

2.—Make a thick paste of pulverized binoxide of manganese and a strong solution of silicate of soda.

*Clark's, for Coating the Sheathing of Cables.*—Mineral pitch, 65 parts; sand, 30 parts; tar, 5 parts.

*Door Plates, Composition for.*—The composition is merely sealing wax run on the plates when they are hot, and then scraped off with a scraper.

*Flowers and Fruits, Mass for Artificial.*—Mix bread crumbs, magnesia and finely powdered starch. When fermented it can be formed and colored to any pattern. Use the lakes to color, and a solution of gamboge in alcohol for a varnish.

*Gutta Percha Composition.*—A hard composition is made of the following: Gutta percha, 6 parts; ivory or bone dust, 2 parts; pipeclay, 1 part. It has a light color.

*Insulating Compound (Chatterton's) for Joining the Layers of Gutta Percha in Cable Core.*—This compound is employed for uniting the different coatings of gutta percha cores, and for cementing gutta percha to wood, etc. It is sold in rolls about 1 in. thick and 7 to 8 in. long. It should soften readily at 38° C. (100° F.), and become firm again when cooled for a few minutes. Its freshly cut surface should be smooth and compact; it should not break, but bend easily with slight elasticity; its specific gravity is about 1.020; it should not become hard or brittle on exposure to the air. The following process is adopted for its manufacture: One-fifth, by weight, of Stockholm tar, and about the same weight of rosin, are put into a jacketed vessel, heated by steam, strained when melted, and intimately mixed, with three-fifths, by weight, of cleansed gutta percha, in shreds or thin pieces. The whole is worked together by horizontal stirrers, fixed on a vertical shaft.

*Insulating Mass, Flexible.*—Shellac, 40 parts, by weight; dry, finely pulverized asbestos, flax, cotton, wood or paper, 40 parts; wood tar, 25 parts; mineral wax (paraffine, ozocerite), 1¼ parts. Mix these ingredients together in a vessel at 100 to 200° F. Stir constantly. If a

## Miscellaneous Formulas

### (Compositions)

harder mass is desired, use less tar. For a very hard mass, put in less asbestos, and leave out the wax. Add about 30 parts of ground slate or clay which does not contain iron.

**Moldable Mass.**—According to the *Deutsche Drugisten Zeitung*, a plastic mass is produced from wood dust, 17 parts; levigated calcic carbonate, 27 parts; sodium silicate (sp. gr. 1.3 to 1.4), 56 parts. The hardening sets in rapidly, and the mass possesses great tensile and transverse strength and a relatively low specific weight. It can be worked in every manner, and dyed, and is suitable for the production of toy building blocks and ornamented pieces for children, etc.

**Ornaments from Wood Mass.**—1.—To produce a cheap composition for molding, mirror and picture frames, rosettes, etc., take whiting, 12 parts; fine sifted sawdust, 6 parts; linseed oil cake,  $1\frac{1}{2}$  parts. Knead this mass to a paste with a strong solution of glue.

2.—Pulverized litharge, 8 parts; white lead, 16 parts; fine sawdust, 2 parts; plaster of paris, 20 parts; stir these ingredients into 26 parts of glue dissolved in water, q. s.

3.—Melt black pitch, 2 parts, in oil of turpentine, 4 parts; liquify glue, 4 parts, in linseed oil, 4 parts. Mix the two together, add 4 parts of fine sifted sawdust, 4 parts of whiting and 4 parts of colcothar. The molds should be oiled, and the mass pressed carefully into them.

**Patterns, Composition for.** The following composition is commonly used: Soften 12 lb. of good glue in water enough to cover it, then heat until the glue is dissolved. Melt 7 lb. of rosin,  $\frac{1}{2}$  lb. of pitch and  $2\frac{1}{2}$  pt. of linseed oil together. Stir the hot glue solution into this and add enough whiting to thicken. It should be mixed in small quantities, and used at once; otherwise, it will require steaming before it can be used.

**Pegamoid.**—The following receipt for the mixture of a coating for bookbinder's pasteboard is said to be very similar to the composition of pegamoid: Camphor, 100 parts; mastic, 100 parts; bleached shellac, 50 parts; guncothon, 200 parts; acetone, 200 parts; acetic ether, 100 parts; ethyl ether, 50 parts.

**Plastic Composition.**—Mixing pounded fragments of mica with a proper proportion of shellac forms a composition which can be molded with ease.

**Plastic Compositions, and Cements for Forming Counterpart Rollers or Plates Used for Embossing Paper, Asbestos, or Similar Impreessible Fabrics in Hollow**

### (Cork)

**Relief.**—Oxidized or solidified oil, 70 lb.; kauri gum, 10 lb.; rosin, 10 lb.; litharge,  $2\frac{1}{2}$  lb.; heated in a steam-jacketed pan and agitated. To render the cement more adhesive, from 2 to 5% of castor oil should be added while mixing. Of this cement, 20 lb. are compounded with 18 lb. of cork dust or wood flour, 18 lb. of asbestos or whiting, and  $\frac{1}{4}$  lb. of driers. The plastic composition may be made of varying degrees of hardness by varying the proportion of gum, rosin and driers, and is applied hot.

**Rubber Composition.**—Cooper's best glue,  $8\frac{1}{2}$  oz.; extra syrup, 2 gal.; glycerine, 1 pt.; Venice turpentine, 2 oz. Steep the glue in rain water until pliant, and drain it well. Then melt it over a moderate fire, but do not "cook it." This will take 15 to 25 minutes. Next put in the syrup, and boil for three-quarters of an hour, stirring it occasionally, and skimming off impurities rising to the surface. Add the glycerine and turpentine a few minutes before removing from the fire, and pour slowly. Slightly reduce or increase the glue as the weather becomes colder or warmer.

**Toys, Composition for.**—Fine ground argillaceous slate, 50%; rag-paper waste, 20%; burnt plaster, 30%; mixed with the necessary volume of water to form a paste, which is then cast in molds, the molds having been previously daubed with finely ground slate, powdered plaster or fat. A sufficiently thick crust will form in a few minutes, when the residuum of the mixture must be poured out of the mold. The mixture, which is unbreakable, hardens very rapidly. The castings thus produced may be immersed in paraffine or stearine, or they can be japanned. In the latter case it is desirable, so as not to consume too much paint, to first apply a coat of quick-drying boiled oil, and when the oil has become hard the article is to be painted.

**Unclassified Composition.**—Five parts of sifted whiting, mixed with a solution of one part of glue, together with a little Venice turpentine to obviate the brittleness, makes a good plastic material, which may be kneaded into figures of any desired shape. It should be kept warm while being worked. It becomes as hard as stone when dry.

**Confectionery. (See ICE CREAMS, ETC.)**

**Cork.**

**Cork, To Work.**—To work cork into symmetrical shapes, as pen handles, etc., cut approximately to shape with a wet

## Miscellaneous Formulas

### (Dragon's Blood)

knife, using a drawing cut, and finish with a coarse emery wheel.

**Artificial Cork.**—Phellosene, or artificial cork, is made by grinding cork bark to an impalpable powder, and making it into a dough with a solution of nitrocellulose in acetone. This is molded, compressed, and allowed to dry. The material contains from 10 to 12% of nitrocellulose, and is claimed by its French inventor to be but very slightly more combustible than cork itself.

**Bleaching Corks.**—The effect of the usual bleaching agents upon corks is not what one would expect; in many cases these cause corks to become darker, and not lighter, in color. Chlorine, however, will render the corks paler, but will impart to them a yellow color, and if used in large quantity will destroy the material and render it rotten. Oil of vitriol is not suitable for bleaching purposes, since it is never entirely washed out of the corks, and, being a non-volatile and powerful acid, it blackens them when they are dry, should they be submitted to a slight heat. Try a solution of chloride of lime (bleaching powder), followed by a solution of hydrochloric acid, both slightly warm, and finally wash with water. A good white can also be obtained by dipping in hard white spirit varnish which has been ground with a little zinc white and thinned with methylated spirit.

**Boring Corks.**—If the corks are bored by hand, they are held by the left hand while the cutter (a steel tube sharpened at one end) is pressed with a rotary motion through them with the right hand. A pair of gas pliers may be used to hold them, but the less pressure employed the better, as it interferes with the passage of the cutter.

**Powdering and Pulping Cork.**—Passing cork between corrugated or roughened rollers will reduce it to a powder; heating it in a boiler, under pressure, with water, will reduce it to pulp.

**Reducing Size of Bottle Corks.**—To make a large cork fit a small bottle, it is the common practice to trim the sides of the cork. Often the knife is dull, and the cut irregular. A simpler way is to cut a wedge-shaped piece out of the cork across its lower end. If the cork is very large, cut out an additional piece at right angles to the first. This will make a perfect non-spilling stopper.

### Dragon's Blood, Facticious.

Red sanders, 7 parts; yellow rosin, 9 parts; castor oil, 2 parts; benzoic acid,

### (Enamel Colors)

3 parts; oxalate of lime, 1 part; phosphate of lime, 2 parts. Mix, with heat.

**Dyeing.** (See special chapter.)

**Electrometallurgy.** (See special chapter.)

### Embalming Fluids.

The following is a formula for the embalming fluid approved by a committee of the National Funeral Directors' Association of the United States: Solution of formaldehyde, 11 lb.; glycerine, 4 lb.; sodium borate, 2½ lb.; boric acid, 1 lb.; potassium nitrate, 2½ lb.; solution of eosin, 1%, 1 oz.; water, enough to make 10 gal. The sodium borate, boric acid and potassium nitrate are dissolved in 6 gal. of water; the glycerine is added, then the solution of formaldehyde, and lastly the solution of eosin, and the necessary amount of water.

**Morell's Antiseptic Liquid.**—Arsenious acid, 14 oz.; caustic soda, 7 oz.; water, 20 oz.; carbolic acid, sufficient to render the fluid, after stirring, opalescent; then add water enough to make 100 oz. Mix well.

**Modern Formulas.**—1.—Salicylic acid, 4 dr.; boric acid, 5 dr.; potassium carbonate, 1 dr.; oil of cinnamon, 4 dr.; oil of cloves, 3 dr.; glycerine, 5 oz.; alcohol, 12 oz.; hot water, 12 oz. Dissolve the first three ingredients in the water and glycerine, the oils in the alcohol, and mix the solutions.

2.—Thymol, 15 gr.; alcohol, ½ oz.; glycerine, 10 oz.; water, 5 oz.

3.—Potassium nitrate, 40 grams; potassium carbonate, 40 grams; glycerine, 1,000 c.c. Success in the use of any embalming fluid depends largely on manipulation, an important part of the process being the thorough removal of fluid from the circulatory system before undertaking the injection of the embalming fluid.

### Enamel Colors.

Millway Vanes says (*Sci. Am. Supp.*, No. 387): "I place little importance on these, as they might be had in any quantity. When in a powdered state, and well ground, they are ready for mixing with the proper vehicles on the color slab. These vehicles are raw turpentine, the oil of turpentine and the oil of tar. The turpentine is placed in a gallipot, which is again placed in a saucer. The turpentine, in time, fattens, and ere long over the edge of the gallipot into the saucer, and 'fattens' into the oil of turpentine, which can be thinned by raw turpentine for use. To this should be added another gallipot and saucer, containing tar oil. Now here

## Miscellaneous Formulas

### (Enamel Colors)

comes the technical use of these vehicles. The colors should not be made too fat, or left too raw. I have said that the lights in enamel painting are taken out by the pencil—always a camel's-hair one. If the color be too fat, this cannot be cleanly done; or if it be too raw, a similar evil is encountered. To perfect the color, in use, a little tar oil is mixed with it, and occasionally used in taking out the lights. This was the manipulation, or *modus operandi*, of one of the greatest painters—one of the finest wild-flower painters in the world; and in my experience I have followed the same practice with the best results. To the camel's-hair pencil should be added the stick, or holder, which performs some of the most important work in the art of enamel painting. It should be made of alder wood, and sharpened at the end away from the pencil. With this the artist takes out the sharpest and most brilliant lights of the picture, occasionally cleaning the end of the pencil stick on the front of his working coat, and then wetting on the tip of his tongue for a cleaner touch. There are no art materials, possibly, so diversified in quality as enamel slabs for painting on, and enamel colors for use in enamel pictures. All these colors, being of a mineral character, require the best chemical mixing and the finest grinding. Rose colors and purple, having bases of gold, are sometimes tampered with in the use of a baser material in the manufacture of these colors; and blues and reds are difficult of obtaining for pure art purposes. A great enamel artist used in his blues a little chloride of sodium, or common salt; and his rose colors and purples were generally of the first make.

"Having secured an unblemished porcelain slab or other porcelain article, the subject might be sketched in with a little Indian ink, rubbed up in water; then the work is commenced for the first firing. The work can either have a background, or can be painted without one; and here the skill of the artist is first tried. The background in the first coloring might be bossed in with a small dabber, and then the subject taken out, and arranged, of course, according to the lights and darks and colors of the picture. First, second, third, and perhaps a fourth firing, may be required as the work goes on, shadows darkening, tints brought out, and the background receiving the most beautiful and effective stippling, until at last this work of art stands out before the admiring gaze of the beholders a finished work of technical ability, gorgeous in colors,

### (Enamel Colors)

most deep and rich in tone, and defying all the power of time in permanency of hues. But even here a few other touches might be required and another firing given. To this end the artist before alluded to used a little white enamel, mixed in water, giving the finest dots, as it were, for seed pearls, and the work was finished. Enamel colors are prepared from the oxides of different metals with a vitreous flux. The principal colors are oxides of lead, platinum, chromium, uranium. Oxides of tin and antimony give opacity."

**Black.**—Crystal glass, 30 grams; borax, 8 grams; cupric oxide, 4 grams; ferric oxide, 3 grams; cobaltic oxide, 4 grams; manganic oxide, 4 grams.

**Blue.**—1.—Flint glass, 6½ oz.; red lead, 20 oz.; pearlash, 4 oz.; white enamel, 8 oz.; common salt, 4 oz.; best blue calx, 6 oz. To be run down in the glost oven, then ground, and add 4 oz. of red lead; then grind it, and it will be fit for use.

2.—Zaffer, 26 oz.; pearlash, 18 oz.; charcoal, 1 teaspoonful.

3.—Dark Blue.—Crystal glass, 30 grams; borax, 6 grams; cobaltic oxide, 4 grams; bone black, 4 grams; arsenic acid, 2 grams.

4.—Flux for Blue.—Flint, 16 lb.; lead, 2 lb.; borax, 2½ lb.; pearlash, 1 lb.

5.—Transparent Blue.—Crystal glass, 34 grams; borax, 6 grams; cobaltic oxide, 4 grams.

6.—Violet Blue.—a.—Tartar, 4 oz.; red lead, 2 oz.; flint, 5 oz.; magnesia, ½ oz.

b.—Glass, 14 parts; red lead, 5 parts; white enamel, 1 part; blue calx, 2 parts. Good.

c.—Glass, 10 parts; red lead, 5 parts; niter, 2 parts; calcined white enamel, ½ part; blue calx, ½ part. Good.

**Crystal Enamel.**—Dissolve 1 oz. white lac in 10 oz. of warm alcohol. Let the mixture stand for some weeks, then decant the clear portion for use.

**Gold on an Enamelled Surface, To Stamp.**—Use thin gold size and a hot brand.

**Green.**—1.—Dark.—Crystal glass, 30 grams; borax, 8 grams; cupric oxide, 4 grams; bone black, 4 grams; arsenic acid, 2 grams.

2.—Transparent.—Crystal glass, 80 grams; cupric oxide, 4 grams; borax, 2 grams.

**Pink.**—Oxide of tin, 100 lb.; chloride of lime, 50 lb.; oxide of chrome, 5 lb.; 10 lb. of the foregoing to 1 lb. of flint.

**Red.**—1.—Carmelian Red.—a.—Chromate of iron, 1 part; flux, 3½ parts.

b.—Flux.—Red lead, 3 parts; glass, 1

## Miscellaneous Formulas

### (Enamel Colors)

part; flint, 1 part. No other flux would do for this. The flux must be highly calcined until it forms a dark glass.

2.—Enamel Red.—a.—Litharge, 3 parts; antimony, 2 parts; iron scales, 1 part.

b.—Litharge, 1 part; antimony, 1 part; iron scales, red and yellow,  $\frac{1}{2}$  part, to be spread on plates in glost oven.

3.—Flux for Red.—Red lead, 6 oz.; borax, 4 oz.; flint glass, 2 oz. To be run down over common fire.

4.—Transparent.—Cassius gold-purple, 65 gms.; crystal glass, 30 grams; borax, 4 grams.

**Rose Colors.**—1.—Gold, 1 gr., dissolved in aquaregia; block tin, 4 gr., dissolved in same; pour each separately into a basin of cold water, then drop in the tin, when dissolved, and stir with a feather; then let stand 6 hours until precipitated; then wash it in hot water, after which add the following: Borax, 3 parts; flint, 1 part; calx, 1 part.

2.—Rose Flux.—Glass, 14 parts; red lead, 5 parts.

**Violet.**—Crystal glass, 30 grams; borax, 4 grams; manganese, 4 grams; cobaltic oxide, 12 decigrams.

**White.**—1.—Crystal glass, 30 grams; stannic oxide, 6 grams; borax, 6 grams; arsenic acid, 2 grams.

2.—Crystal glass, 30 grams; sodium antimonate, 10 grams.

The finely pulverized colored enamel is applied with a brush and lavender oil on the white enamel, already fused in, and then only heated until it melts. For certain purposes, the color compositions may also be fused in without a white ground. The glass used for white, No. 2, must be free from lead, otherwise the enamel will be unsightly.

**Yellow.**—1.—Litharge, 8 parts; flint, 6 parts; antimony, 3 parts; ochre, 2 parts; glass, 4 parts.

2.—Litharge, 3 parts; powdered brick, 4 parts; oxide of iron, 1 part; antimony, 3 parts; to be calcined in glost oven and spread on glost plates.

3.—Enamel Yellow.—White lead, 6 lb.; flint,  $\frac{1}{2}$  lb.; tin ashes,  $\frac{1}{2}$  lb.; to be mixed well together, run down in an enameling heat, and poured into warm water.

4.—Flux for Yellow.—Red lead, 3 oz.; flint, 1 oz.

For information on the Art of Enameling (Vitreoous) Cast Iron for Industrial Purposes, Hollow Ware, Signs, etc., Many Details of the Processes, from the Preparation of the Metal and Enamels to the Finished Product, see our Scientific American Supplement Numbers 1349, 1350,

### (Etching)

1351, \*1352, \*1353 and 1792. (\*) Indicates illustrations of furnaces, grinding mills, etc.

**Engraved Plates.** (See Plates, Engraved.)

**Etching.** (For etching in photo-engraving see PHOTOGRAPHY.)

**Aluminum.**—Alcohol, 4 oz.; acetic acid, 6 oz.; butter of antimony, 4 oz.; water, 40 oz.

**Brass.**—1.—Alcohol, 4 oz.; chromic acid, 4 oz.; water, 40 oz.

2.—Nitric acid, 16 parts (sp. gr. 1.40); add to 160 parts of water; dissolve 6 pt. of potassium chlorate in 100 parts of water. Mix the two solutions.

3.—Many of the etching receipts for copper apply here: Nos. 1, 2 and 3 particularly.

4.—For surface printing on brass in the lithographic manner, Roret's Manual gives: Gum arabic, 8 parts; nutgalls, 2 parts; nitric acid, 1 part; phosphoric acid, 4 parts; water, 30 parts.

**Brass Signs.**—Paint the sign with asphalt varnish, leaving the parts to be etched unpainted, raise a border around the outside, made of soft beeswax or asphalt, to hold the acid. Use nitric acid diluted with 5 times the quantity of water. Pour the dilute acid on to the sign about  $\frac{1}{4}$  in. deep. When the letters are cut deep enough, which must be found by trial, the acid may be poured off and the plate cleaned by heating and wiping, and finally with turpentine.

**Bronze.**—For etching bronze the following is given in Roret's "Manuel du Graveur": Pure nitric acid at 40°, 100 parts; muriatic acid at 20°, 5 parts. Also try any of the copper etching formulas.

**Copper Etching.**—1.—Nitric or sulphuric acid, 1 part; potassium bichromate saturated solution, 2 parts; water, 5 parts.

2.—Callot and Piranesi.—Strong vinegar, 8 parts; verdigris, 4 parts; ammonium chloride, 4 parts; salt, 4 parts; alum, 1 part; water, 16 parts.

3.—Dutch Mordant.—Hydrochloric acid (fuming, sp. gr. 1.90), 10 parts; water, 70 parts; then add boiling solution of potassium chlorate; dilute.

4.—Fielding.—Nitrous acid, 1 part; water, 5 parts. Used for aquatints.

5.—Lahanne.—Nitric acid, 40°, mixed with an equal amount of water; add pieces of scrap copper.

6.—Relief Etching.—Nitrous acid, 30°. 1 oz.; silver acetate, 3 dr.; nitric ether (hydrated), 8 oz. To prepare nitric ether, mix 1 oz. of alcohol, 1 oz. of nitric acid,

## Miscellaneous Formulas

### (Etching)

and stop reaction by adding 4 oz. of pure water.

7.—Roret's.—Distilled vinegar, 1 l.; ammonium chloride, 60 grams; sodium chloride, 60 grams; pure verdigris, 40 grams. Grind up the solids and boil in the vinegar. Acetic acid (at 3°) may be used in place of vinegar.

8.—Tint Etching (Roret's).—Bay salt, 2 parts; ammonium chloride, 1 part; verdigris, 1 part. Grind up with old honey (syrup).

*Film for Tracing with a Needle.*—Mr. H. Trueman Wood sends the following to the *Photographic News*: There are many purposes in photography for which an opaque film capable of being etched with a sharp point might be useful. Such a film can be obtained by use of the following formula: Negative collodion,  $\frac{1}{2}$  oz.; ether, 6 dr.; alcohol, 6 dr.; shellac, 30 gr.; aurine, 2 gr.; Judson's mauve dye, 30 drops; water, 30 drops.

*Lead.*—Alcohol, 4 oz.; tin bichloride,  $2\frac{1}{2}$  oz.; water, 40 oz.

*Resists.*—1.—White wax, 30 parts; gum mastic, 30 parts; asphaltum, 15 parts.

2.—White wax, 30 parts; gum mastic, 15 parts; asphaltum, 15 parts.

3.—White wax, 60 parts; gum mastic, 30 parts; asphaltum, 60 parts.

4.—White wax, 3 parts; black pitch, 1 part; asphaltum, 4 parts; rosin, 1 part.

5.—Callot's ground linseed-oil varnish and mastic; heat until the wax is melted, filter, apply with brush, and heat plate until varnish stops smoking.

6.—White wax, 2 oz.; black and Burgundy pitch, of each  $\frac{1}{2}$  oz.; melt together; add by degrees, powdered asphaltum, 2 oz., and boil till a drop taken out on a plate will break when cold by being bent double two or three times; pour into warm water and make into small balls.

*Silver.*—Proceed as for copper or brass, but great care must be used in preparing a proper ground and in stopping out.

*Steel.*—Nitric or hydrochloric acid, or mixtures of the two, are employed as the "acid" in marking or etching on steel. The following are among the methods employed:

1.—Glacial acetic acid, 4 parts; absolute alcohol, 1 part; nitric acid (sp. gr. 1.28), 1 part. Allow the acetic acid and alcohol to remain for half an hour, then add nitric acid carefully. Etch from 1 to 15 minutes. The parts you wish to protect from corrosion must be covered with beeswax, tallow, or similar substance.

### (Etching)

2.—The first step to be careful about is to have the print heavily inked and then powdered up with dragon's blood several times before starting to etch. To do this properly, every operator has noticed that after powdering, and slightly heating, additional powder will stick, and will form a heavy coating in two or three operations with the powder. Before proceeding to heat up good the plate should receive a light etching in a weak solution of the acid described later on. By giving this etching the print is cleaned up, and will not thicken up the lines, as would be the case without this etching. Then a good strong heating should be given. On top the dragon's blood plumbago may be used in addition. For etching, use nitric acid mixed with an even amount of acetic acid. Some operators use vinegar, based on the same theory. When commencing the etching, start with a weak solution, and increase as soon as the plate is deep enough to allow another powdering. If the operator is familiar with lithography, and understands to roll the print up with a litho-roller, the etching of steel is not harder than etching on zinc.

3.—Iodine, 16 parts; iron filings, 1 part; water, 64 parts. Digest until the iron is dissolved. Keep well stoppered until required for use.

4.—Fuming hydrochloric acid (sp. gr. 1.190), 1 part; distilled water, 19 parts; solution potassium chlorate, 1:50, 10 parts.

5.—Copper sulphate, 2 oz.; alum,  $\frac{1}{2}$  oz.; salt,  $\frac{1}{2}$  oz.; mixed with  $\frac{1}{2}$  pt. of vinegar and 40 drops of nitric acid, can be used for frosting the steel.

6.—Alcohol, 3 parts; distilled water, 5 parts; nitric acid, 8 parts; silver nitrate, 8 parts. Wash the plate with very dilute nitrate acid, then apply the solution for 3 minutes, and wash with 6% solution of alcohol. Repeat if necessary.

7.—(Deleschamp's, for vertical bite.)—Silver acetate, 2 parts; rectified spirits, 125 parts; distilled water, 125 parts; nitric acid, 65 parts; nitric ether (see No. 5 of copper etching above), 16 parts; oxalic acid, 1 part.

8.—Iodine, 4 parts; potassium iodide, 10 parts; water, 80 parts. This is very highly recommended.

9.—No. 3 of copper etching, above.

10.—(Roret's).—Nitric acid, 62 parts; water, 125 parts; alcohol, 187 parts; copper nitrate, 8 parts.

11.—Cover the surface with a thin coat of asphaltum varnish of fine quality, then cut the design through to the surface of the steel, and etch with a weak solution



## Miscellaneous Formulas

### (Etching)

of nitric acid in water; finally, wash with hot water and remove the asphaltum with hot turpentine.

12.—For steel.—Iodine,  $1\frac{1}{2}$  oz.; iron filings,  $\frac{3}{4}$  dr.; water, 6 oz. Digest until the iron is dissolved.

13.—For fine touches, take 6 parts each of verdigris, sea salt and sal ammoniac; dissolve in 12 parts of vinegar, add 24 parts of water, boil a minute, and allow to cool.

14.—Clean the steel, and cover evenly with wax; cut the lines with a steel point through the wax, and pour on the following etching fluid: Pyroligneous acid, 4 oz.; alcohol, 1 oz.; nitric acid, 1 oz., by measure. Or, use iodine, 1 oz.; iron filings,  $\frac{1}{2}$  dr.; water, 4 oz. Etching fluid is removed as soon as the metal is sufficiently etched.

15.—Cutlery.—a.—For etching on cutlery a ground wax is required, composed of equal parts of asphaltum, Burgundy pitch and beeswax, melted together, and thoroughly incorporated. In applying it, use a dabber, or ball of cotton covered with silk. Warm the piece of cutlery so that a stick of the wax will readily melt by touching. Smear a small quantity of the wax on the blade or articles, and dab it evenly all over the surface. When cold, scratch the required design or name on the surface, and touch the parts with acid (nitric acid, 1 part; water, 4 to 6 parts), using a camel's-hair pencil to cover the surface and bring the acid into contact with all the lines. In a few minutes the biting is done. Dip in hot water to wash off the acid, and the surface may be cleaned by wiping with benzine. Another way is to make a varnish of asphalt and turpentine, with a few drops of linseed oil to make it tacky. Have a rubber stamp made of the required design, with a border, so as to stop off around the design. Stamp the goods, and with some of the varnish, thinned down with turpentine, and a brush, stop off the surrounding parts; or surround the design with a small rim of beeswax, and apply the acid as above.

b.—For etching brands and marks on polished steel surfaces, such as saws, knifeblades and tools, where there are many pieces to be done alike, procure a rubber stamp with the required design, made so that the letters and figures that are to be bitten by the acid shall be depressed in the stamp. Have a plain border around the design, large enough to allow a little border of common putty to be laid around the edge of the stamped design to receive the acid. For ink, use

### (Fish Bait)

rosin, lard, oil, turpentine and lamplblack. To  $\frac{1}{4}$  lb. of rosin put 1 teaspoonful of lard oil; melt, and stir in a tablespoonful of lamplblack; thoroughly mix, and add enough turpentine to make it of the consistency of printer's ink when cold. Use this on the stamp, in the same manner as when stamping with ink. When the plate is stamped, place a little border of common putty around and on the edge of the stamped ground. Then pour within the border enough acid mixture to cover the figure, and let it stand a few moments, according to the depth required; then pour the acid off. Rinse the surface with clean water, take off the putty border, and clean off the ink with turpentine. Use care not to spill the acid over the polished part of the article. For the acid, 1 part nitric acid, 1 part hydrochloric acid, to 10 parts of water by measure. If the effervescence seems too active, add more water.

*Tools, Marking.*—To mark tools, warm them slightly, and rub the steel with wax, or hard tallow, until a film gathers. Then scratch the letters on the wax, cutting through to the steel. A little nitric acid poured on the writing will quickly eat out the letters. Wash off the acid and remove the wax with a hot rag, and the letters will be securely etched.

### Files, To Sharpen by Chemical Means.

Boil the files in strong soda and water to clean off all grease, oil or gum. Then dip for a few minutes in a bath of nitric acid, 1 part; water, 4 parts; the length of time being less on fine files, as your experience may suggest.

*To Resharpen Old Files.*—Wash the files in warm potash water to remove the grease and dirt, then wash in warm water, and dry by heat. Put  $1\frac{1}{2}$  pt. of warm water in a wooden vessel, put in the files, add 3 oz. of blue vitriol, finely powdered, and 3 oz. of borax. Mix well, and turn the files so that every one may come in contact with the mixture. Add  $10\frac{1}{2}$  oz. of sulphuric acid and  $\frac{1}{2}$  oz. of cider vinegar. Remove the files after a short time, dry, rub with olive oil, wrap in porous paper. Coarse files should be kept in the mixture for a longer time than fine ones.

### Fish Bait.

In "The Complete Angler," Izak Walton says that of pastes to catch fish there are almost as many sorts as there are remedies for toothache. In his directions for taking fish he gives a number of

## Miscellaneous Formulas

### (Flowers and Plants)

pastes, the following being those he considers the most efficient:

1.—Cheese made into a paste with turpentine.

2.—Rabbit's flesh, cut fine, 1 part; bean flour, 1 part; honey, enough. Pound these well in a mortar.

3.—Make a tough paste of brown-bread crumbs and honey.

4.—Beat into a paste, in a warm mortar, sheep's tallow and soft cheese.

5.—White bread crumbs, worked up between the fingers until tough.

More modern pastes may be made according to the appended formulas:

6.—Asafetida, in tears, 1 part; white wax, 1 part. Melt together, strain, and stir until cool.

7.—Graham flour, 1 oz.; juice of lovage root, enough. Beat into a tough paste.

To make these pastes less liable to be washed from the hook, shreds of wool or cotton are often incorporated in the mass.

8.—*Fish Food for Trout and Carp.*—Mix meal flour, 65 parts; gold pleasure seed or linseed, ground, 3 parts; powdered rape seed, 2 parts; maize or beans, crushed, 10 parts; peas, crushed, 10 parts; coarsely ground grain (preferably wheat), 10 parts. This mixture is kneaded with 10 parts of common salt and sufficient water, into a stiff paste, and by means of a syringe, with an opening as large as a lead pencil, spread on a board, strewed with flour, and left to dry.

9.—*Preparation for Luring Fish and Game.*—Oil of rhodium, 3 parts; oil of cumin, 2 parts; tincture of musk, 1 part. Mix. Put a drop or two on the bait, or rub trigger of trap with same.

10.—*Production of Scented Fish Bait.*—For moistening the bait, we need, according to the *Pharmazeutische Rundschau*, the following preparations: (1) Peruvian balsam, 1; oil of mirbane (nitro-benzol), 1; anhydrous alcohol, 1. (2) Musk, .05; civet, .25; Peruvian balsam, 4; oil of aniseed, 1.5. (3) Extract of fresh "broad bean" leaves, 10 to 150, mixed with 10 of nitric ether, and 1 drop of volatile animal oil. (4) Especially for trout: civet with redwood oil.

### Flowers and Plants.

1.—*Blue Roses.*—The *Scientific American* publishes a recipe for blue roses, which are simply white roses whose stems have been submerged in the following solution: Water, 100 c.c.; aniline methylene dye, 2 grams; potassium nitrate, 2 grams. This color scheme, representing a little less than  $\frac{1}{2}$  pt. of water and a little over  $\frac{1}{2}$  oz. each of aniline dye and

### (Flowers and Plants)

saltpeter, is worth trying for the sake of novelty.

2.—*Color, To Preserve.*—a.—The following varnish is recommended for coating the stalks of flowers for the preservation of their color and general character: Isinglass, 11 oz.; concentrated glycerine, 9 oz. The isinglass is to be softened by first soaking it in cold water, and then dissolving it in the glycerine by digestion and agitation, with the latter heated to 212° F. over a water bath. When properly prepared, this varnish is colorless, and when cold resembles rubber in all but color.

b.—Another varnish recommended for this purpose is prepared from bleached gutta percha, 1 oz.; deodorized benzole, 7 oz. The gutta percha is cut into fine shreds and gradually added to and agitated with the solvent, kept hot (or warm) over a sand bath, away from the fire. The whole flower may be dipped into this varnish, shaken, and exposed to the air to dry. Another preparation suggested for this purpose is plain collodion diluted one third, and mixed with 2% of camphor also dissolved in a small quantity of ether and alcohol.

c.—Dissolve 1 pt. of salicylic acid in 600 parts of alcohol, heat the solution up to boiling point in an evaporating vessel and draw the plants slowly through it. Shake them to get rid of any superfluous moisture, and then dry between sheets of blotting paper under pressure in the ordinary manner. Too prolonged immersion discolors violet flowers, and in all cases the blotting paper must be frequently renewed. The novelty appears to be the salicylic acid.

d.—A. F. Woods describes a method of preserving the green color of plants for exhibition purposes which appears to be similar in principle to the coppering of green peas. Air is removed as completely as possible from the surface and intercellular spaces of the plants by immersion in 90 to 95% alcohol, or an air pump may be employed. The plants are next immersed in dilute glycerine (5%) to which a bluish tint has been imparted by means of copper sulphate or acetate. The copper combines with the chlorophyll, forming copper phyllocyanate, which is practically insoluble in any ordinary preservative medium except strong alcohol, and is not affected by light. Any excess of copper salt may be dissolved out by a mixture of dilute glycerine and formaline, which may also be employed with advantage as the preservative medium.

e.—A method of preserving the natural

## Miscellaneous Formulas

### (Flowers and Plants)

colors of flowers, recommended by R. Hegler, in the *Deutsche Botanische Monatshefte*, consists in dusting salicylic acid on the plants as they lie in the press, and removing it again with a brush when the flowers are dry. Red colors, in particular, are well preserved by this agent. Another method of applying the same preservative is to use a solution of 1 part of salicylic acid in 14 parts of alcohol, by means of blotting paper or cotton wool soaked in it and placed above and below the flowers. Powdered boracic acid yields nearly as good results. Dr. Schouland, in the *Gardeners' Chronicle*, recommends, as an improvement in the method of using sulphurous acid for preserving the color, that in the case of delicate flowers they might be placed loosely between sheets of vegetable parchment before immersion in the liquid, so as to preserve their natural form.

f.—Insert their stems in water in which 25 gr. of ammonium chloride (sal ammoniac) have been dissolved. Flowers can be preserved in this way for 15 to 30 days. To preserve them permanently for several months, dip them into perfectly limpid gum water and then allow them to drain. The gum forms a complete coating on the stems and petals, and preserves their shape and color long after they have become dry.

g.—Flowers in Water.—Any kind of flower can be well preserved for at least two weeks by putting a little saltpeter or carbonate of soda in the water in which the flowers are left standing.

h.—The usual method of preserving cut flowers in a condition of freshness is to dissolve small amounts of ammonium chloride, potassium nitrate, sodium carbonate or camphor in the water into which the stems are inserted. The presence of one or the other of these drugs keeps the flowers from losing their turgidity, by stimulating the cells to action and by opposing germ growth. Flowers that have already wilted are said to quickly revive if the stems are inserted in a weak camphor water.

i.—Dr. Dixon states that tincture of *nux vomica* added to the water in which cut flowers are kept exercises a stimulant effect upon the flowers. The *chrysanthemums* on which he tried it held their freshness for an unusually long time.

*Leaves, Preserving.*—1.—They may, after pressing, be dipped in melted beeswax; the same may be applied solid to the surface and be melted with a hot smoothing iron; or they may be varnished with dammar varnish or Canada balsam.

### (Flowers and Plants)

Varnishing is objectionable on account of the time required for drying.

2.—It depends somewhat upon the season when the leaves develop their greatest beauty and variety of tints. Sumac, and the leaves of similar plants or trees, are usually gathered early in October. Maple, alder, oak, linden, etc., are then at their best. To preserve the leaves, they should be thoroughly dried as soon as possible after gathering and trimming. A simple method of drying the leaves expeditiously is the following: Spread the leaves, and press in a suitable pan with alternate layers of fine sifted dry sand heated as hot as the hand can bear, and set aside to cool. When the sand has cooled the leaves may be removed, smoothed under a hot iron, dipped for a moment in clear French spirit varnish, and allowed to dry in the air.

3.—Melted paraffine and wax are sometimes preferred to the varnish.

4.—The following is another way: Spread several thicknesses of fine wrapping paper on the ironing table; arrange the leaves of the spray, picking off those which do not add to its beauty, and lay it out smooth. Pass a warm flatiron over a cake of wax, and then over the leaves, first on one side and then on the other. Then place the sprays between sheets of bibulous paper, and put under pressure between two flat boards for several weeks, changing the paper several times.

*Leaves, Skeleton, To Make.*—Place the leaves in a little rain water to which a trace of yeast has been added. Allow the fermentation to proceed until the membranous portion becomes soft and easily washed away in a stream of water. They are bleached by dipping for a few minutes in a strong aqueous solution of sulphurous acid gas, or exposing them, while moist, in a box filled with the vapor of burning sulphur.

*Leaves, To Copy.*—Take a piece of thin muslin, and wrap it tightly around a ball of cotton wool as big as an orange. This forms a dabber, and should have something to hold it by. Then squeeze on to the corner of a half sheet of foolscap a little color from a tube of oil paint. Take up a very little color on the dabber, and work it about on the center of the paper for some time, till the dabber is evenly covered with a thin coating. A little oil can be used to dilute or moisten the color, if necessary. Then put your leaf down on the paper and dab some color evenly over both sides. Place it then between the pages of a folded sheet of paper (un-glazed is best), and rub the paper above

## Miscellaneous Formulas

### (Foundry Facings)

it well all over with the finger. Open the sheet, remove the leaf, and you will have an impression of each side of the leaf. Any color may be used. Burnt or raw sienna works the most satisfactorily.

#### Foundry Facings.

The description of facing sand which Mr. H. F. Frohman gives in the paper which he read before the Western Foundrymen's Association, is just about as clear an explanation as could be desired by any one seeking to know the rationale of certain operations in the ironfounder's craft. It is free of all chemical terminology, which too frequently serves to confuse and obscure simple phenomena. It explains in the simplest language exactly that which working foundrymen want to know. He tells how the most common facing to mix with the sand is coal dust, and gives the reason for it. The crushed coal is mixed with the sand which is nearest to the surface of the mold, in order to break up the particles of sand, so that when the molten metal comes into the mold it does not fuse the sand to a hard mass similar to glass, but allows the coal to burn away, thus leaving the sand in a separated condition, so that when the casting has cooled these separated particles of sand will readily drop off. This can be verified by putting a small quantity of silica sand into a heated vessel so that the temperature will just about fuse the sand. It will melt and run together into a solid mass. There is another reason for the use of coal dust, and that is that it will help materially to vent the mold and allow the gases to escape. Coal dust for facing sand should be made from the best quality of soft or bituminous coal, containing neither slate nor phosphorus, but high in hydrocarbon gases and volatile matter, and the best gas coal

### (Freezing)

makes the best dust for facing. This is the only kind of facing that is mixed with the sand. There are other facings, such as charcoal blacking, but these are either dusted on the mold or applied wet with a brush, as the class of work requires.

#### Freezing, To Prevent.

*Non-freezing Fluids for Central Heating Plants, Machines, etc.*—For such purposes glycerine and alcohol are used. A solution of 28% of chloride of calcium in water, which will withstand a temperature of 22° below zero Fahrenheit without freezing, and does not attack metals, is cheaper. Other recipe: In 100 parts are contained 1 part of chloride of magnesium, 10 parts of chloride of calcium, 20 parts of chloride of alumina. "Tektrion," a charging fluid for central heating plants, consists of a 25° B<sub>e</sub> solution of chloride of calcium that boils at a little over 212° F., and resists cold of 5° F. For heating plants that are not so liable to be frozen up, a chloride of calcium lye of 15° B<sub>e</sub>, which resists freezing to 17½° F., may be used. The addition of glycerine to the solution is not advisable.

*Incongealable Liquid.*—In numerous instances a fluid is required which does not freeze. For many machines, and in artillery, glycerine, which is quite expensive, is employed for this purpose. An admixture of alcohol increases the cost still more. The *Revue Technique* recommends in place thereof a 28% solution of calcium chloride, which is very cheap, and remains liquid up to a temperature of 32° C. It does not attack any metals, which is of especial importance. In lieu thereof, one may also employ the somewhat dearer solution of calcium chloride, 10 parts; aluminum chloride, 20 parts; magnesium chloride, 1 part.

#### Freezing Mixtures.

	Thermometer degrees F.	Actual depression of slake temperature, degrees F.
1. Snow or pounded ice, 2 parts; sodium chloride, 1 part	.. to — 5	..
2. Snow or pounded ice, 5 parts; sodium chloride, 2 parts; ammonium chloride, 1 part. From any temperature	.. to — 12	..
3. Snow or pounded ice, 24 parts; sodium chloride, 10 parts; ammonium chloride, 5 parts; potassium nitrate, 5 parts. From any temperature	.. to — 18	..
4. Snow or pounded ice, 12 parts; sodium chloride, 5 parts; ammonium nitrate, 5 parts. From any temperature	.. to — 25	..
5. Sodium phosphate, 3 parts; ammonium nitrate, 2 parts; diluted mixed acids, 4 parts	from — 34 to — 50	16
6. Snow, 8 parts; dilute sulphuric acid, 10 parts	" — 68 to — 91	23
7. Snow, 1 part; crystallized calcium chloride, 3 parts	" — 40 to — 73	33

# Miscellaneous Formulas

(Gelatine)		(Gelatine)	
Freezing Mixtures—Continued		Thermometer sinks, degrees F.	Actual reduction of temperature, degrees F.
8. Sodium phosphate, 5 parts; ammonium nitrate, 3 parts; dilute nitric acid, 4 parts.....	"	0 to—34	34
9. Ammonium nitrate, 1 part; water, 1 part.....	"	40 to 4	36
10. Ammonium chloride, 5 parts; potassium nitrate, 5 parts; water, 16 parts.....	"	50 to 10	40
11. Snow, 1 part; dilute sulphuric acid, 1 part.....	"	—20 to—60	40
12. Snow, 3 parts; dilute nitric acid, 2 parts.....	"	0 to—46	46
13. Snow, 8 parts; dilute sulphuric acid, 3 parts; dilute nitric acid, 3 parts.....	"	—10 to—56	46
14. Ammonium chloride, 5 parts; potassium nitrate, 5 parts; sodium sulphate, 8 parts; water, 16 parts..	"	50 to 4	46
15. Sodium sulphate, 5 parts; dilute sulphuric acid, 4 parts .....	"	50 to 3	47
16. Sodium nitrate, 3 parts; dilute nitric acid, 2 parts..	"	50 to—3	53
17. Snow, 2 parts; calcium chloride, 3 parts.....	"	—15 to—68	53
18. Snow, 3 parts; dilute sulphuric acid, 2 parts.....	"	32 to 23	55
19. Ammonium nitrate, 1 part; sodium carbonate, 1 part; water, 1 part.....	"	50 to—7	57
20. Snow, 8 parts; hydrochloric acid, 5 parts.....	"	32 to—27	59
21. Sodium sulphate, 6 parts; ammonium chloride, 4 parts; potassium nitrate, 2 parts; dilute nitric acid, 4 parts.....	"	50 to—10	60
22. Sodium phosphate, 9 parts; dilute nitric acid, 4 parts	"	50 to—12	62
23. Snow, 7 parts; dilute nitric acid, 4 parts.....	"	32 to—30	62
24. Snow, 1 part; crystallized calcium chloride, 2 parts	"	0 to—66	66
25. Snow, 3 parts; calcium chloride, 4 parts.....	"	20 to—48	68
26. Snow, 4 parts; calcium chloride, 5 parts.....	"	32 to—40	72
27. Snow, 2 parts; crystallized calcium chloride, 3 parts	"	32 to—50	82
28. Snow, 3 parts; potash, 4 parts.....	"	32 to—51	83
29. Sodium sulphate, 6 parts; ammonium nitrate, 5 parts; dilute nitric acid, 4 parts.....	"	50 to—40	90

## Gall.

*Gall. To Decolorize.* To 1 pt. of gall, boiled and skimmed, add 1 oz. of alum, and leave the mixture on the fire until the alum is dissolved. When cold, pour into a bottle, and cork loosely. Next treat another pint of gall in the same way, only substituting salt for alum. In about 3 months these preparations will deposit a sediment, then decant the fluid portion and mix them. A precipitate is immediately formed, which takes down the coloring matter and the fluid portion is removed.

*Orgall. To Clarify.* Let the gall of a newly killed ox settle for 12 hours; pour off the liquor and boil until somewhat thick. Then spread it upon a dish until almost dry; place in jelly pots covered with paper. When desired for use, dissolve a small piece in 1 tablespoonful of water.

## Gelatine

*Bichromated Gelatine.*—Make a hot saturated solution of bichromate of potash in water, and in another vessel make a strong solution of gelatine. Then pour

them together, stir well, and allow to cool. The proportion of bichrome solution which is added varies according to the use. On exposure to the light it becomes insoluble, which is useful in many ways.

*Non-setting Gelatine.*—There are many purposes for which a non-setting gelatine is of considerable value, the direct carbon or pigment printing being one. Long, long ago, so long as to be almost forgotten, Maxwell Lytle, we think, introduced a method of producing one, under the name of "meta gelatine," but the following, recommended by Dr. F. Mallmann, will be found both simpler and better: Water, 1,000 parts; chloral hydrate, 250 parts; gelatine, 400 parts. Soak the gelatine in the water, and apply a gentle heat till dissolved, and then add the chloral.

*Gelatine Sheets.*—Dissolve fine glue or isinglass in water so that the solution, when cold, may be consistent. Pour it hot on a plate of glass (previously warmed with steam, and slightly greased), fitted in a metallic frame whose edges are just as high as the wafer should be thick. Lay on the surface a second glass plate,

## Miscellaneous Formulas

### (Grease-Proofing)

also hot and greased, so as to touch every point of the gelatine while resting on the edges of the frame. By its pressure the thin cake is rendered uniform. When the glass plates have cooled, the gelatine will be solid, and may be removed. It can then be cut into disks by punches, etc. It can, of course, be colored by adding suitable coloring material, aniline colors, for instance.

**To Make Gelatine Iridescent.**—A. Poussolle has received a patent for a process for giving to gelatine the appearance of mother of pearl. In his specification he describes the process as consisting of treating an aqueous solution of gelatine with ammonium bromide, drying, and immersing in an aqueous solution of silver nitrate. After contact for a certain time the gelatine is again dried, and immersed in a clear solution of collodion, and finally dried.

**Glass.** (See special chapter.)

### **Gold, Acid Test for: Touchstone.**

The ordinary ready method of ascertaining whether a piece of jewelry is made of gold consists in touching it with a glass stopper wetted with nitric acid, which leaves gold untouched, but colors base alloys blue from the formation of nitrate of copper. The "touchstone" sometimes used in testing is said to be a species of black basalt, obtained chiefly from Silesia. If a piece of gold be drawn across its surface a golden streak is left, which is said to be not affected by moistening with nitric acid; while the streak left by brass or other base alloy would be rapidly dissolved by the acid. Experience enables an operator to determine by means of the touchstone pretty nearly the amount of gold present in an alloy, comparison being made with the streaks left by alloys of known composition. It is claimed that the fitness of the stone for this use arises from its easily abrading the metal, not being itself affected by nitric acid, and presenting a dark, smooth ground adapted for exhibiting the shades of color.

### **Grease-proof Boxes.**

The following is the composition of a preparation used for painting the interior of cardboard or wooden boxes to make them greaseproof: Fish glue, 1 lb.; rosin,  $\frac{1}{4}$  oz.; litharge,  $\frac{1}{2}$  oz.; glycerine,  $\frac{1}{2}$  oz.; kaolin,  $\frac{1}{2}$  oz.; water, 40 oz. Boil the glycerine, litharge and part of the water together to dissolve, then mix in the other ingredients. The liquid is applied to the inside of the boxes with a

### (Insulating Material)

brush, and allow to dry, the application to be repeated if necessary.

### **Guncotton.**

It may be prepared in small quantities, as follows: Mix  $4\frac{1}{2}$  oz. of pure dry nitrate of potash with 30 fldr. of sulphuric acid, sp. gr. 1.845, and after cooling thoroughly stir into this mixture, carefully, 120 gr. of best carded cotton. As soon as saturation is complete, in about 4 minutes, if proper care has been used, throw the cotton into a tubful of clean rain water, and change the water repeatedly until litmus ceases to show the presence of acid, then squeeze it in a cloth, and after being well pulled out, dry it cautiously at a temperature not exceeding  $140^{\circ}$  F. It is now explosive, and too much caution cannot be observed in handling it.

### **Honey, Artificial.**

For artificial honey there are several good formulas. The following is one: Sugar, 10 parts; rain water, 3 parts. Bring to a boil over a slow fire, and let boil gently for 15 minutes, skimming all the while. Let cool, and add 3 parts of good old strained honey and 5 drops of oil of peppermint for every gallon of product. The best imitation is made with loaf sugar. If this be used, the article cannot, by the taste alone, be told from the genuine. If common brown sugar be used, it will be necessary to boil the syrup a little longer and to skim with care. The addition of 20 gr. of cream of tartar to the gallon is said to improve the article. Caution: Beware of misbranding this as "Honey."

**Household Formulas.** (See special chapter.)

### **Ice Powder.**

Ammonium chloride, in coarse powder, 2 oz.; potassium nitrate, in coarse powder, 2 oz. Mix.

**Insecticides.** (See special chapter.)

### **Insulating Material.**

1.—Linsed oil, 2 parts; cotton-seed oil, 1 part; heavy petroleum, 2 parts; light coal tar, 2 parts; Venice turpentine,  $\frac{1}{2}$  part; spirits of turpentine, 1 part; gutta serena, 16 part; sulphur, 2 parts; heat the oils separately to about  $300^{\circ}$  F., cool to  $240^{\circ}$ , and mix in the other materials, the sulphur last. Heat to  $300^{\circ}$  F. for an hour, or until the mixture becomes pasty, and on cooling is soft and elastic.

2.—*Flexible Insulating Material for*

## Miscellaneous Formulas

### (Kerosene)

**Electric Conductors.**—Mineral wax, paraffine, ozokerite, each 1 part; wood tar, 20 parts; shellac and asbestos, flax or cotton, wood or paper, 32 parts, in a dry, finely pulverized condition; mixed at 100 to 212° F. in a kettle, and continuously stirred. If a harder mass is required, the proportion of wood tar is reduced. To obtain a particularly hard mass the wax may be omitted, about 24 parts of crushed slate, infusorial earth, or clay, free from iron, added, and the quantity of asbestos, etc., to be added reduced.

3.—**Insulating Sheets for Electric Conductors.**—The insulating material consists of 768 parts of rubber, 166 parts of sulphate of antimony, 58 parts of sulphur, which may also be omitted, 195 parts of lime (chalk), 130 parts of magnesite, 922 parts of carbonate of magnesia. The production of insulating sheets, tablets, or rolls from this mass, which may also be mixed with Chinese gum lac, the acidity of which is neutralized by boiling with carbonate of potash, consists in placing a suitable number of plates made from this substance between sheets of zinc, one on the other, and then vulcanizing them at a temperature of 250 to 300° F., and under a pressure of 132,000 to 220,000 lb. The gum lac may be replaced by vegetable fibers. During vulcanization at an augmented temperature (of 300 to 340° F.) the rollers may be dusted with talcum powder or the like.

4. **Insulating Wood.**—a.—Wood for battery jars, etc., is also rendered insulating by steeping it in or brushing it with melted paraffine.

b.—An insulator of 2 parts by weight of Greek pitch and 2 parts of burnt plaster of paris is used for electric light work in France. The plaster is pure gypsum, highly heated, and plunged in water. The compound is applied hot, with a brush. (See also **Compositions**, above.)

**Ivory.** (See **Bone and Ivory**; also chapter on **LAPIDARY ARTS**.)

**Kerosene, Masking Odor of.** (See also **Petroleum**.)

Various processes have been recommended for masking the odor of kerosene, such as the addition of various essential oils, artificial oil of myrbane, etc., but none of them seems entirely satisfactory. The addition of amyl acetate in the proportion of 10 grams to the liter (1%) has also been suggested, several experimenters reporting very successful results therefrom. Some years ago Beringer proposed a process for removing sulphur compounds from benzine, which would

### (Lard)

presumably be equally applicable to kerosene. The process is as follows: Potassium permanganate, 1 oz.; sulphuric acid,  $\frac{1}{2}$  pt.; water,  $3\frac{1}{2}$  pt. Mix the acid and water, and when the mixture has become cold pour it into a 2-gal. bottle; add the permanganate, and agitate until it is dissolved. Then add 1 gal. of benzine, and thoroughly agitate. Allow the liquids to remain in contact for 24 hours, frequently agitating the mixture. Separate the benzine, and wash in a similar bottle with a mixture of potassium permanganate,  $\frac{1}{2}$  oz.; caustic soda,  $\frac{1}{2}$  oz.; water, 2 pt. Agitate the mixture frequently during several hours, then separate the benzine and wash it thoroughly with water. On agitating the benzine with the acid permanganate solution an emulsion-like mixture is produced, which separates in a few seconds, the permanganate slowly subsiding, and showing considerable reduction. In the above process it is quite probable that the time specified (24 hours) is greatly in excess of what is necessary, as the reduction takes place almost entirely in a very short time. It has also been suggested that if the process were adopted on a manufacturing scale, with mechanical agitation, the time could be reduced to an hour or two.

### Kieselguhr.

Kieselguhr is an infusorial earth, which is principally used in the manufacture of dynamite. It is a white powder, and, as it consists of the skeletons of diatoms, is of a siliceous character, and well adapted for making polishing soap.

### Lampblack.

For processes for the Manufacture of Lampblack, Boneblack and Carbon-black from Coal, Natural and Acetylene Gases, see our Scientific American Supplement Numbers \*866, \*980 and 1263. (\*) indicates illustration of soot chamber.

**Lapidary Art.** (See special chapter.)

### Lard.

**Lard, To Prepare.**—In preparing lard for the market it should first be cut into pieces about the size of a walnut, and these should be allowed to stand in water for half an hour. Then work the material with the hands in 5 or 6 successive portions of water. Next pour off the water, melt the lard in a water bath, and strain through fine linen. In the first straining it will be impossible to get rid of all the water, so that after cooling and draining it will be necessary to remelt the

## Miscellaneous Formulas

### (Magnesia)

lard and finally to filter it through paper in a warm closet.

**Lard, Making.**—1.—Cut the fat up into pieces 2 in. square; fill a vessel holding about 3 gal. with the pieces; put in 1 pt. of boiled lye, made from oak and hickory ashes, and strained before using; boil gently over a slow fire, until the cracklings have turned brown; strain, and set aside to cool. By the above process you will get more lard, a better article, and whiter, than by any other process.

2.—Cleanliness is the great point in treating lard. The fat is freed from all adhering fleshy or discolored matter by cutting. It is then cut up into small pieces, and washed until the water runs off clear. It is next melted by direct fire or steam coil until it becomes perfectly clear. It is run through close linen filters into the barrels, in which it is stirred until white and opaque, but only thickly fluid. The great point is when to cease stirring. It is then cooled and tightly covered. Air makes it rancid.

**Lard, To Keep Sweet.**—Even during the warmest weather lard can be kept sweet by the following plan: When rendering (melting) it, throw into each kettle a handful of fresh slippery elm bark. No further preparation is necessary. No salt must be added to it at any time. The jars in which the lard is to be kept must be thoroughly cleansed.

**Leather.** (See special chapter.)

**Lime, Vienna.**

This is used for polishing. It is prepared from dolomite. The dolomite is burned, slaked and glowd. For use, rub the articles with alcohol, and apply the lime. Keep the lime in a well stoppered bottle.

**Lubricants.** (See special chapter.)

**Magnesia, Citrate of.**

1.—Magnesium carbonate, 4 oz.; citric acid, 8 oz.; sugar, 12 oz.; water, 9 pt. Flavor with essence of lemon, then dissolve and filter, fill bottles immediately, and add to each 30 gr. of potassium hydrogen carbonate, and cork securely. Bottles must not be filled any higher than the shoulder. The receipt is sufficient for 12 bottles.

2.—Carbonate of magnesia, 4 oz.; citric acid, 8 oz.; oil of lemon, 25 drops; sugar, 14 oz.; water, q. s. Drop the lemon oil on 4 oz. of carbonate of magnesia, scrape it, and place, together with the citric acid and 6 parts of water, in a wide-mouthed bottle. In the course of a few hours the solution will be effected. Add the sugar,

### (Matches)

and dissolve by frequent agitation. Filter through paper, and divide the clear liquid into 12 suitable bottles. Lastly, these bottles must be nearly filled with filtered water, and to each of them is added, immediately before corking, 40 gr. of chemically pure bicarbonate of soda.

**Matches.**

**Manufacture of Matches.**—Each factory uses its own methods and chemical mixtures, though in a general way the latter do not vary greatly. It is impossible here to give a full account of the different steps of manufacture, and of all the precautions necessary to turn out good marketable matches. However, in the manufacture of the ordinary safety match, the wood is first comminuted and reduced to the final shape, and then steeped in a solution of ammonium phosphate (2% of this salt with 1 or 1½% of phosphoric acid), or in a solution of ammonium sulphate (2½%), then drained and dried. The object of this application is to prevent the match from continuing to glow after the match has been burned out. Next the matches are dipped into a paraffine or stearine bath, and after that into the match bath proper, which is best done by machines constructed for the purpose. Here are two formulas for the "composition":

1.—Potassium chlorate, 2,000 parts; lead binoxide, 1,150 parts; red lead, 2,500 parts; antimony trisulphide, 1,250 parts; gum arabic, 670 parts; paraffine, 250 parts; potassium bichromate, 1,318 parts.

2.—Potassium chlorate, 2,000 parts; lead binoxide, 2,150 parts; red lead, 2,500 parts; antimony trisulphide, 1,250 parts; gum arabic, 670 parts; paraffine, 250 parts.

Rub the paraffine and antimony trisulphide together, and then add the other ingredients. Enough water is added to bring the mass to a proper consistency when heated. Conduct heating operations on a water bath. The sticks are first dipped in a solution of paraffine in benzine and then are dried. For striking surfaces, mix red phosphorus, 9 parts; pulverized iron pyrites, 7 parts; pulverized glass, 3 parts; gum arabic or glue, 1 part; water, q. s. To make the matches water or damp proof, employ glue instead of gum arabic in the above formula, and conduct the operations in a darkened room. For parlor matches, dry the splints and immerse their ends in melted stearine. Then dip in the following mixture, and dry: Red phosphorus, 3 parts; gum arabic or tragacanth, 0.5 part; water, 3



## Miscellaneous Formulas

### (Matches)

parts; finely ground sand, 2 parts; lead binoxide, 2 parts. Perfume by dipping in a solution of benzoic acid.

**Match-Making Machinery.** Illustrated articles on this subject are contained in our *Scientific American Supplement* Nos. \*1210, \*1241 and \*1704.

**Chlorate Matches.** Chlorate of potassa, 30 gr.; flowers of sulphur, 10 gr.; powdered lump sugar, 8 gr.; powdered gum arabic, 5 gr.; vermilion, enough to color. Reduce the chlorate to fine powder in a marble or Wedgwood ware mortar, then place it on a stone slab, add the other ingredients, and mix them all together with a wooden or bone knife, adding just sufficient water to make a paste. Into this mixture the points of matches, made of slips of thin wood or paste-board, are to be dipped, and afterward carefully dried in a moderately warm situation.

**English Matches.**—1.—Fine glue, 2 parts, soaked in water till quite soft; water, 4 parts; heated together in a water bath till quite fluid. Remove the vessel from the bath and add  $1\frac{1}{2}$  to 2 parts of phosphorus, agitating the mixture briskly and continually with a stirrer having wooden pegs or bristles projecting beneath. When the mass is uniform, 4 or 5 parts of chlorate of potash, 3 or 4 parts of powdered glass, and sufficient coloring matter in the form of red lead, smalts, etc., are cautiously added, and the whole is stirred till cool.

2.—Red or amorphous is substituted for yellow phosphorus in match heads. The composition of the igniting paste is given as follows: Soaked glue (1 to 5 of water), 37; powdered glass, 7.5; whiting, 7.5; amorphous phosphorus, pure, 10; paraffine wax, 1; chlorate of potash, 27; sugar of lampblack, 7. Silicate of soda may be substituted for the glue, bichromate of potash added for damp climates, and sulphur for large matches.

**Friction Matches.** 1.—Ordinary kinds are small slips of wood which have been dipped in sulphur and afterward tipped with a paste capable of ignition by friction. This paste contains common phosphorus, 4 parts; niter, 16 parts; red lead, 3 parts; strong lead, 6 parts.

2.—Ordinary phosphorus, 9 parts; niter, 14 parts; binoxide of manganese, 14 parts; gum or glue, 16 parts. Melt the glue at 212° F., gradually add the phosphorus, which must be well stirred into the liquid; then add the niter and coloring matter. Keep the paste at a regular temperature of about 97° F. by means of hot water under the marble or cast-iron slab on which it is spread while the

### (Matches)

matches are being dipped. If gum is used all the operations may be more easily performed, as the materials can be mixed cold, but the matches made with gum are easily spoiled by damp.

3.—Fine glue, 2 parts; water, 4 parts; phosphorus,  $1\frac{1}{2}$  to 2 parts; potassium chlorate, 4 to 5 parts; powdered glass, 3 to 4 parts. Red or white lead or smalt sufficient to color.

4.—The following is a match which may be lighted by friction upon any surface whatever, and which possesses the advantages of being free from danger and of emitting no unpleasant odor. The mixture into which the splints are first dipped consists of chlorate of potash, 6 parts; sulphide of antimony, 2 parts; gum,  $1\frac{1}{2}$  parts; powdered clay,  $1\frac{1}{2}$  parts. The inflammable compound consists of chlorate of potash, 2 to 3 parts; amorphous phosphorus, 6 parts; gum,  $1\frac{1}{2}$  parts; aniline,  $1\frac{1}{2}$  parts.

5.—The following, although containing no white or yellow phosphorus, may be ignited by friction against any substance. Powdered glass, 80 parts; amorphous phosphorus, 10 parts; sulphur, 10 parts. These are mixed, then is added a solution of 850 parts of potassium chlorate in 300 parts of water and 70 parts of glue. Lastly, there is added to the paste finely powdered potassium ferrocyanide, 50 parts.

**Paraffin.** Dry the splints, and immerse the ends in melted stearine. Then dip in the following mixture and dry: Phosphorus, red, 3 parts; gum arabic or tragacanth, 0.5 part; water, 3 parts; finely ground sand, 2 parts; binoxide of lead, 2 parts. Perfume by dipping in a solution of benzoic acid.

**Safety Matches.**—a.—Chlorate of potassium, 2,000; binoxide of lead, 1,150; red lead, 2,500; trisulphide of antimony, 1,250; gum arabic, 670; paraffine, 250; bichromate of potassium, 1,218.

b.—Chlorate of potassium, 2,000; binoxide of lead, 2,150; red lead, 2,500; trisulphide of antimony, 1,250; gum arabic, 670; paraffine, 250.

Rub the paraffine and antimony together, and then add to other ingredients. Enough water is added to bring the mass to a proper consistency when heated. Conduct heating operations on a water bath. The sticks are first dipped in a solution of paraffine in benzine, and then dried. For striking purposes, mix red phosphorus, 9 parts; pulverized iron pyrites, 7 parts; pulverized glass, 3 parts; gum, or glue, 1 part; water, q. s.

2.—Dip the splints in a paste composed of chlorate of potash, 6 parts; sulphide

## Miscellaneous Formulas

### (Matches)

of antimony, 2 to 3 parts; glue, weighed dry, 1 part. The paste for the rubbing surface is amorphous phosphorus, 10 parts; oxide of manganese, or sulphide of antimony, 8 parts; glue, 3 to 6 parts, weighed dry. The ingredients must be thoroughly mixed, and care must be taken not to mix the chlorate of potash in the dry state with the other materials; it should be mixed first with glue dissolved in warm water. The paste for the rubbing surface may be spread with a brush or spatula on the side of the box.

3.—Glue, 16 parts; chrome yellow, 2 parts; oxide of iron, 2 parts; peroxide of manganese, 24 parts; hyposulphite of lead, 8 parts; chlorate of potash, 56 parts. Composition for the box: Hyposulphite of lead, 260 parts; chlorate of potash, 11 parts; oxide of iron, 7 parts; powdered glass, 8 parts; finest glue, 4 parts; amorphous phosphorus, 21 parts. Glue is dissolved in water; other ingredients being in powder, are afterward mixed with it to the consistency of paint, and applied with a brush to the surface of the box.

*Silent Matches.*—1. Dissolve 16 parts of gum arabic in the least possible quantity of water, triturate in 9 parts of powdered phosphorus, and add 14 parts of niter, 16 parts of vermilion or binoxide of manganese, and form the whole into a paste.

2.—Six parts of glue soaked in a little cold water for 24 hours, and liquified by trituration in a heated mortar; add 1 part of phosphorus, and rub down at a heat not exceeding 150° F. (66° C.); mix in 10 parts of powdered niter and then 5 parts of red ochre and 2 parts of smalts, and form the whole into a uniform paste.

3.—Instead of phosphorus, lead sulphocyanate, mixed with precipitated antimony sulphide, is treated in the moist state with an oxymercure substance, such as potassium chlorate, with indifferent coloring and rubbing agents, such as glass, quartz, pumice powder, ultramarine, etc., and with glutinous substances, such as glue, gum and dextrine. The mixture is used in place of the materials employed for igniting sulphur matches, wax lights, etc.

4.—Weigh out 30 parts of powdered chlorate of potash, 10 parts of powdered sulphur, 8 parts of sugar and 5 parts of gum arabic, with a little cinnabar to communicate color. The sugar, gum and salt are first rubbed together into a thin paste with water. The sulphur is then added, and the whole having been thoroughly beaten together, small brimstone matches

### (Matches)

are dipped in, so as to retain a thin coat of the mixture upon their sulphured ends. When quite dry they are fit for use.

*Swedish.*—1. Matches from Sweden were found to be tipped with an igniting composition made up of the following substances, in 100 parts: Glass, 8.77; glue, 7.12; potassic bichromate, 5.59; potassic chlorate, 16.76; ferric oxide, 1.09; manganese, 13.07; sulphur, 7.11. It is supposed that the following proportions were employed in the manufacture of the composition: Glass, 14 lb.; glue, 1 lb.; potassic bichromate, 4.5 lb.; potassic chlorate, 63 lb.; ferric oxide, 1 lb.; manganese, 2 lb.; sulphur, 1 lb. In consequence of the small proportion of oxygen-yielding substance to sulphur, a large quantity of sulphurous acid is evolved on igniting the mass.

2. In another composition, likewise from Sweden, Wiederhold found to 1 of sulphur 24 of potassic chlorate. This composition yielded no free sulphurous acid, the sulphur being wholly oxidized to sulphuric acid.

3. *Basas.* Vestas are tipped with similar ingredients, but the paper being less rigid than wood, a larger proportion of phosphorus is added.

4. *Vesuvians.* The heads of vesuvians are made up principally with powdered charcoal and sulphur in some such proportions as the following: Sulphur, 18 parts; charcoal, 10 parts; powdered glass, 7 parts; gum arabic, 5 or 6 parts; to these ingredients are added a little scent, in the form of satinwood, benzoinite dust, cascarilla bark or gum benzoin, which renders them fragrant while burning. The igniting composition is identical with safety matches.

*Without Phosphorus.*—1. For the production of these, there is a mixture of from 1 to 6 parts of chlorate of potash and 2 parts each of bichromate of potash and oxide of iron or lead, with 5 parts of strong glue is used. For the treating surface a mixture of 20 parts of sulphate of antimony, 2 to 4 parts of bichromate of potash, 4 to 6 parts oxide of either iron, lead or manganese, 2 parts of glass powder and from 2 to 3 parts of strong glue or gum. These matches will ignite only on the friction surface thus prepared.

2.—For the match heads a mixture of chlorate of potash and a compound of hyposulphurous acid with soda, ammonia and oxide and suboxide of copper. This compound is formed by dividing a solution of copper into two equal parts, supersaturating one of them with ammonia and the other with hyposulphate of

## Miscellaneous Formulas

### (Mica)

soda; then mixing the two solutions and stirring the mixture well; a violet powder precipitates. One part of it is to be mixed with 2 parts of the chlorate of potash and a small quantity of pounded glass. Lucifers made in this way are, however, objectionable from the fact that they will ignite on any rough surface, even more easily than the common kind.

3.—The following is one of the best receipts for composition match tips without phosphorus. It is the same as that used in preparing the well-known U. and P. matches, and does not require a separate rubber or prepared surface: Potassium chlorate, 26 oz.; manganese, black oxide, 25 oz.; potassium bichromate, 20 oz.; lead cyanide, 20 oz.; antimony oxysulphide, 20 oz.; glass powder, 4 oz. These substances are first powdered separately, and then gradually mixed into a solution of 1 lb. of gum in 4 lb. of water, to form a thick, smooth paste; with this paste the dry wood splinters are tipped, and after about 18 hours' exposure to the air in a drying-room, kept at about 80° F., the matches are ready for boxing. To render the matches non-absorbent of moisture, or waterproof, they are momentarily dipped into a liquid composed of best white shellac, 1 lb.; alcohol, or wood naphtha, 1 qt.; digested together in a closed vessel for several days, with occasional agitation, then strained through fine linen cloth.

*Without Sulphur.*—Char the ends of the splints with red hot iron, dip them into a thin layer of stearic acid or wax, melted in a flat-bottomed tinned copper pan. The dipping paste for these matches is ordinary phosphorus, 3 parts; strong glue, 3.5 parts; water, 3 parts, fine sand, 2 parts; coloring matter, 0.1 to 0.5 part; chlorate of potash, 3 parts. These matches burn readily, with a bright flame, and have no unpleasant smell. Amorphous phosphorus not being poisonous, or liable to accidental ignition, is preferable to ordinary phosphorus. The paste used is amorphous phosphorus, 3 parts; chlorate of potash, 4 parts; glue, 2.5 parts; water, 5 parts; pounded glass, 2 parts.

### Mica, To Pulverize.

When mica is heated to redness for some time in a muffle, and then allowed to cool rather quickly, the laminae become distorted, and the sheets present a silvery-white appearance by reflected light, the mineral losing much of its flexibility. The dust of this whitened mica is used to some extent by the French as silver bronze powder. Mixed with a weak solution of gum arabic, it makes a good silver ink.

### (Natural History Specimens)

The powder is sometimes variously tinted by washes of very dilute colored solutions of gums or varnishes. To prepare the glistening powder the sheets of whitened mica are simply crushed, not ground, boiled in hydrochloric acid, rinsed, dried, and assorted to size of laminae. The finer filaments have a pearly luster, and are made to adhere to semi-softened gelatine and wax to imitate pearl. The silvery powder is used on metals, glass, wood, paper, plaster, tapestry and furniture. It has also been used in calico printing in place of the heavy bronze and glass dust of Lyons fabrics, and for the decoration of china and glassware.

### Naphthalene.

One of the secondary products of the gas manufacture, or of the destructive distillation of coal. When pure it forms thin, white flakes, of a pungent taste. It is insoluble in water, but dissolves readily in alcohol, ether, and in acetic and oxalic acids. It melts at 79° F., and has the sp. gr. 1.045. It is not readily inflammable, and burns with a smoky flame.

*Deodorization of Naphthalene.*—Naphthalene has such a disagreeable odor that its use in medicine and surgery is considerably retarded thereby, and it has been found that the mixture of camphor and other deodorants with it is only of temporary benefit. But if the naphthalene be mixed with some benzoin, and then sublimed, the sublimate of naphthalene is free from tarry odor and is pleasant to smell; moreover, it retains this pleasant odor, although this is not the case when the naphthalene is simply mixed with tincture of benzoin or benzoic acid.

### Natural History Specimens.

*Preserving Fluid.*—1.—Nearly saturate water with sulphurous acid and add a little creosote.

2.—Dissolve chloride of lime, 4 parts, in water, 100 parts, to which 3% of hydrochloric acid has been added.

3.—Dissolve corrosive sublimate, 1 part, and sodium chloride, 3 parts, in water, 100 parts, to which 2% of hydrochloric acid has been added.

4.—Ammonium chloride, 1 part; water, 10 or 11 parts. For muscular parts of animals: Zinc sulphate, 1 part; water, 15 to 25 parts. Used for muscles and cerebral masses.

5.—Formaldehyde solution, 40%, 60 parts; glycerine, 120 parts; alcohol, 30 parts; water, 1,000 parts. Mix. Glycerine is necessary only when the specimen is to be kept soft. The fluid can be made

## Miscellaneous Formulas

### (Paper)

perfectly colorless and as limpid as distilled water by filtering through animal charcoal. In dense, massive objects, such as liver, lung, etc., incisions should be made to allow the liquid to penetrate to the interior. It is better to use more formaldehyde solution—90 to 100 parts—in preparing very dense objects.

**Fossils. To Take Casts of.**—Clear the edges of the fossil of the limestone, etc., it may be imbedded in, and paste all around its circumference a piece of smooth note paper, thus making a mold, say half an inch deep. Before, however, pasting the paper, well blacken the surface of the fossil and rub it with grease. Then, after pasting, pour into mold some melted wax, sufficient to make a mold, say, half an inch thick. When cool remove the paper and wax, trim up, if ragged in any part, and then paste another piece of paper around the wax, making the mold to receive the plaster of paris for casts. The plaster of paris should be very fine, and should be mixed with water containing a little albumen, then poured into a mold and allowed to harden, afterward removing and sharpening up with a fine pointed needle. The cast may now be painted, so as to imitate original fossil.

### Oil.

**Lamp Oil.**—Refined rape oil, 20 gal.; water-white petroleum, 5 gal.

**Cyclists' Lamp Oil.**—1. Camphor, 1 oz.; castor oil, 2 oz.; petroleum, 4 oz.; olive oil, 20 oz. Dissolve the camphor in the oils.

2. Paraffine oil, 1 oz.; colza oil, 7 oz.

3. Camphor, 1 oz.; petroleum, 4 oz.; colza oil, 20 oz.

**Railways. Burning Oil for.**—Sweet cotton, 1 part; refined rape, 1 part; extra refined Arctic sperm, 1 part; mineral colza, 15%.

**Paints and Varnishes.** (See special chapter.)

**Paper.** (See also chapter on WRITING MATERIALS.)

**Canox.**—Sheets of stout manila passed through a hot bath of aqueous solution of zinc chloride at 75° F., pressed strongly together, and then soaked in dilute aqueous soda solution containing a small amount of glycerine, cohere to form a strong, stiff, waterproof board admirably adapted to the construction of small boats. Single sheets of paper passed quickly through the zinc chloride bath, pressed and washed and dried, are waterproof,

### (Petroleum)

and may be otherwise joined to form waterproof boards by any suitable cement.

**Powder.**—1. Sometimes called pollen powder. Boil the paper for a number of hours, strain, and reduce to fine powder in a mortar. Sift this powder through a fine sieve. The powder is used to give the bloom to artificial fruit and is also used by taxidermists.

2. Boil white paper, or paper cuttings, in water for 5 hours. Pour off the water, pound the pulp in a Wedgwood mortar, and pass through a fine sieve. This powder is employed by the bird stuffers to dust over the legs of some birds and the bills of others, to give them a powdery appearance; also to communicate the downy bloom to rough-coated artificial fruit, and other purposes of a similar nature; it makes excellent pounce.

**Waxing Soap Papers.** Ordinary waxed paper is prepared by placing cartridge or other paper on a hot iron, and rubbing it with beeswax, or by brushing in a solution of wax in turpentine. On a large scale, it is prepared by opening a quire of paper flat upon a table and rapidly ironing it with a very hot iron against which is held a piece of wax, which, melting, runs down upon the paper and is absorbed by it. Any excess on the top-most layer readily penetrates to the lower ones.

**Paraffine (Deodorized).**

Put into a tank, and treat cold with 2% dry chloride of lime and 1% of glacial acetic acid, diluted with an equal quantity of water, well agitating until all the chlorine has come off; then wash well with cold water, adding at the rate of 1 lb. of permanganate of potash dissolved in hot water to each ton. Allow to settle, and draw off liquor, and again wash with fresh water and salt (1 lb. to each 112 lb.), after which allow to settle, and decant. This process removes nearly all the smell, and improves its burning properties.

**Perfumes.** (See TOILET PREPARATION Chapter.)

**Petroleum.** (See also Kerosene.)

**Deodorizing Petroleum.**—1. Petroleum oil, 1 gal.; chloride of lime, 3 oz.; slaked lime, 3 oz.; spirits of salts, sufficient. Mix the chloride of lime with the oil, and add spirits of salts until chlorine gas ceases to be given off, mixing thoroughly. Then pour on to the slaked lime, contained in another vessel, and allow it to remain a couple of days. Then well mix up. Allow the lime to subside, and draw off the petroleum.

## Miscellaneous Formulas

### (Petroleum)

2. Pass petroleum refuse from 8 to 10 times over heated animal charcoal, and filter very slowly. This has a specific gravity of .809 to .814.

3.—Permanganate of potash, 1 lb.; water, 8 gal. Heat the oils to 120° F., and keep at this heat; then add the above fluid, about 2½ to 3 gal. to every 1,120 lb. of oil, and agitate for three-quarters to one hour, bringing the fluid in contact with every part of the oil. Sample, and if result is satisfactory, allow to settle, and draw off by siphon; add if not, add more fluid and proceed as above until the desired result is attained. Heated by open steam.

4.—Digest the paraffine oil with sweet cotton oil, by heat and agitation, and blow steam through it. Introduce sufficient caustic soda or potash to saponify the cotton oil. Decant the oil from the soap solution, say, after 3 or 4 hours' settling. Paraffine oil, 50 gal.; cotton oil, 5 gal. Soda or potash lye of any moderate strength sufficient or rather in excess to saponify the cotton oil after well agitating the paraffine; either heavy or burning oil will separate as a nearly odorless fluid. The residue of soda can be salted out, and sold as paraffine cleansing soap, etc., as, if potash can be boiled with other materials into soft soap. The odor is absorbed and retained by the cotton-oil soap, but we have reason to believe the petroleum regains its peculiar smell after a time; at any rate, the process is expensive for any but a soap-maker, as paintmakers' oil boilers are not clean enough for this process.

5.—According to the *Revue Scientifique*, petroleum may be deodorized by shaking it first with 100 grams of chlorinated lime for every 15 l., adding a little hydrochloric acid, then transferring the liquid to a vessel containing lime, and again shaking until all the chlorine is removed. After standing, the petroleum is decanted.

6.—To mask the unpleasant odor of petroleum, etc., an addition of 1% of amyl acetate is recommended. To destroy the nasty smell of benzine, and at the same time render the benzine colorless, Berninger proceeds as follows: To a mixture of 1 l. of sulphuric acid and 1.75 l. of water add, after cooling, 30 grams of potassium permanganate; next mix with 4.5 l. of benzine, and allow to stand for 24 hours, shaking occasionally. After this period the benzine is lifted off and agitated for several hours with a solution of 7.5 grams of potassium permanganate and 15 grams of sodium carbonate in 1 l. of water.

### (Petroleum)

The separating benzine is said to be odorless and colorless, without having to be again distilled.

7.—Deodorized Petroleum.—Under this name may be included a large number of so-called turpentine substitutes, many of which claim to be highly rectified benzine. They may be used in varnish making or in cases where cutting is necessary. Take 2 oz. of fresh, dry chloride of lime and mix with 1 to 2 oz. (according to strength) of acetic acid; stir well together, and throw into a full barrel of the petroleum it is desired to deodorize. Shake it up well by rolling for a few minutes, and then leave with the bung out for 24 hours. It is best then to draw off the oil, as it will be clear, the lime and acid being at the bottom of the barrel. With the clear oil now mix 4 oz. of fusel oil; shake up well, allow to settle, and the oil will be found quite deodorized. Where time is an object, the fusel oil may be added direct, without the lime treatment, but the above gives the best results.

8.—Agitate 4 l. of petroleum with 100 grams of zinc chloride, and pour the mixture into a vessel containing burnt lime. After mixing well allow to settle, and decant the petroleum.

9.—To a mixture of 0.25 l. of sulphuric acid, 1.75 l. of water and 30 grams of potassium permanganate add 4½ l. of benzine, and mix well. Next allow to settle for 24 hours, and diligently shake the skimmed off benzine with a solution of potassium permanganate, 7.5 grams, and soda, 15 grams, in 1 l. of water.

10. Mix 100 kgn. of petroleum with 1½ kgn. of litharge, 9 kgn. of potash and 20 kgn. of water. The dark color of this petroleum is due to the presence of either light or heavy hydrocarbons. In the former case, ozone is used for bleaching the petroleum. Where heavy hydrocarbons are present, or for such oils as are darkened by the action of light, this method is not available, since it would make them still darker. In this case, the petroleum is treated with reducing agents, such as zinc dust, sodium hyposulphite or stannic chloride. Filtering with bone charcoal is likewise said to give good results. In order to reduce expenses, the charcoal may be cleaned again with acetone, and thus recovered for further use.

11.—Deodorized Petroleum. Rosin, Spirit, Wood Naphtha, etc. Mix glacial acetic acid, 50°, 1 part; water, 1 part. Use equal parts of above with chloride of lime or bleaching powder, 1 lb. of each to 112 lbs. (reckoning 8 lb. of oil

## Miscellaneous Formulas

### (Pharaoh's Serpents)

to the gallon). Put in the time first (dry). To remove any further smell, use washing soda, dissolved in water, 1 lb. to 112 lb.

12.—Deodorized Petroleum Spirit.—Use 2½% lime and 2½% acetic acid on the weight of the spirit. Wash with air and water (cold), after standing overnight.

### Pharaoh's Serpents.

1.—These are little cones of sulphocyanide of mercury, which, when lighted, give forth a long, serpent-like, yellowish brown body. Prepare nitrate of mercury by dissolving mercury dioxide in strong nitric acid as long as it is taken up. Prepare also sulphocyanide of ammonium by mixing 1 volume of sulphide of carbon, 4 volumes of a strong solution of ammonia and 4 volumes of alcohol. This mixture is to be frequently shaken. In the course of about 2 hours the bisulphide will have been dissolved, forming a deep red solution. Boil this until the red color disappears and the solution becomes of a light yellow color. This is to be evaporated at about 80° F., until it crystallizes. Add, little by little, the sulphocyanide to the mercury solution. The sulphocyanide of mercury will precipitate; the supernatant liquid may be poured off, and the mass made into cones of about ½ in. in height. The powder of the sulphocyanide is very irritating to the air passages, and the vapor from the burning cones should be avoided as much as possible. To ignite them, set them on a plate, or the like, and light them at the apex of the cone.

2.—One grain of dry mercury sulphocyanide is mixed with some gum tragacanth which has previously been soaked in hot water. When the gum is completely softened it is transferred to a mortar and the mercury sulphocyanide (in fine powder) is mixed with it by aid of a little water, so as to turn out a somewhat dry pill mass. This is then formed and cut into pellets of the desired size, which are dried on glass. These are very poisonous, and must be handled with care; do not inhale the fumes.

3.—Potassium bichromate, 2 parts; potassium nitrate, 1 part; white sugar, 3 parts. Pulverize each ingredient separately, then mix them thoroughly. Make small paper covers of the desired size and press the mixture into them.

4.—This toy, as originally made, consisted of pellets of a very poisonous mercurial compound, which gave off dangerous fumes when heated. The "eggs" may be made of comparatively safe material by the following formula: Potassium bichro-

### (Plasters)

mate, 2 parts; potassium nitrate, 1 part; white sugar, 2 parts. Powder each ingredient separately, mix, and press into small paper cones. These must be kept from light and moisture. Of course, neither this nor other chemical toys containing substances in the slightest degree harmful if swallowed, should be placed in the hands of children not old enough to fully understand the danger of eating or even tasting unknown things.

Photography. (See special chapter.)

### Pitch.

*Burgundy*.—1.—Impure rosin prepared from the turpentine of the Norway spruce fir.

2. Imitation of.—Melt common rosin with lincseed oil, and color the mass with annatto or palm oil.

3. Melt 100 lb. of good yellow rosin with lincseed oil, 1 gal.; palm oil, bright, q. s. to color. The mixture is allowed to partially cool, when it is pulled with the hands. It is usually sold in bladders.

*Canada*.—Pitch from the hemlock spruce fir.

*Pitch, Chasing*.—Use a mixture of 1 part of beeswax with 2 parts of rosin, with sufficient sweet oil to soften the composition to fancy.

### Plasters.

Plasters are external applications that possess sufficient consistency not to adhere to the fingers when cold, but which become soft and adhesive at the temperature of the human body. They are chiefly composed of unctuous substances united to metallic oxides, or powders, or to wax or resin. Plasters are usually formed while warm into ½ lb. rolls, about 8 or 9 in. long, and wrapped in paper.

*Composition for*.—Burgundy or Canada pitch, 90 parts, are mixed with yellow wax, 10 parts, and melted together. Glue, mixed with glycerine equal to one-tenth the weight of the dry glue, may be used.

*Adhesive Plaster, in Sticks or Rolls*.—

1.—Lead plaster, 100 parts; strained yellow wax, 10 parts; sticking plaster mass, 20 parts; gum dammar, 10 parts; colophony, 10 parts; larch turpentine, 2 parts. Melt the first three articles together in the steam bath. While this is being done, in another vessel, over the free fire, melt, with constant stirring, the gum dammar, continuing the heat until the gum no longer foams, then add the rosin, stir in, and remove from the fire. After cooling down somewhat, stir in the turpentine, and add the whole to the molten mass in the steam bath and stir until homogeneous.

## Miscellaneous Formulas

### (Plates, Filling for)

ous. Remove from the bath, stir until the mass begins to stiffen, then pour on damp parchment paper and roll out.

2.—Litharge, 5 oz.; olive oil, 12 oz.; water, 8 oz. Put the water and litharge into a copper pan. Mix together with a spatula; add the oil, and boil, stirring constantly. This process takes from 4 to 5 hours, but it can be hastened to 20 or 30 minutes by adding 1 oz. of colorless vinegar. To make rosin or strapping plaster, used in retaining the lips of recent cuts and wounds in contact: Mix by a moderate heat 1 oz. of rosin to 5 oz. of litharge plaster (as given above), and spread upon muslin.

### Plates, Filling Engraved.

1. A cheap wax filling for small brass plates is shoemakers' heelball, used plentifully. Warm the plates, and rub the heelball well into the cuts, scraping off the superabundant heelball with the straight edge of a card, and put the plates aside to harden. Then polish off with a piece of coarse flannel and a drop or two of oil.

2.—Another filling is best black sealing wax, ground up fine and placed in the cuts, filling them well up to the surface of the plate and then pressing down, taking care that very little of the powdered wax is left upon the surface of the plate. Then the plate is gradually warmed until the wax in the whole of the work is melted, then placed aside to get cool, rubbed with a bone to remove any wax left on the surface of the plate, and polished with flannel and oil.

3.—Some engravers prefer grinding up their sealing wax with gold size, then filling the work, putting it away to set, and cleaning off with alcohol or spirit of wine. This composition requires time to harden, and sets bright.

4.—Dissolve enough best black or red sealing wax in alcohol to make a thick solution, of the texture of thick cream, and fill the engraved lines with it; when the alcohol is evaporated the solution will gradually harden. Finish as above.

5. A solution made in the same way as No. 4, but considerably thinner, is a good filling for xylonite, ivory, and pearl, filling the cuts, and letting the solution harden for 12 hours, then "dollying" off with a small quantity of whiting in a lathe.

6.—In dealing with red and other wax of a light color, the greatest cleanliness must be observed, as, for instance, instead of holding the plate over the flame of a gas jet, it is much better to use a

### (Pyrotechny)

gas stove, thus obviating smoke. Then grind up the wax very fine, fill the lettering, warm the plate to the melting point of the wax, and press into the cuts with a clean, cold, flat piece of iron. Then rub off the greater surface of the wax with a rasp, taking care not to scratch the surface of the plate; follow with pumice stone, ground flat, and finish with a bone. The polishing can be done with rotten stone, jewelers' rouge, and common oil mixed together to form a red liquid, using 2 or 3 folds of thick cloth wrapped around a large piece of cork or wood as a rubber. As the brilliancy of the red depends greatly on the quality of the wax, it is advisable to procure the best.

### Potatoes, To Solidify.

Make a solution of 4 parts of sulphuric acid in 50 parts of water. Treat peeled potatoes with this solution for 36 hours. Dry the mass between blotting paper, and subject to great pressure. By using very strong pressure, billiard balls have been made closely resembling ivory. The material can be carved, and doubtless could be used for large types.

### Pounce.

Powdered gum sandarac generally passes by this name. Powdered cuttlefish bone is also used. It is used to prepare parchment for writing. The colored powders are used in stamping.

*Pouncing Designs.*—Prick the outline through the paper, and after placing over the sheet to be marked, dust the back with a bag containing powdered charcoal.

*Preserving.* (See special chapter.)

### Pyrotechny.

*Colored Lights.*—These fires serve to illuminate, hence intensity of light with as little smoke as possible is aimed at. In the preparation of such mixtures the ingredients, which should be perfectly dry, must be reduced separately, by grinding in mortar or otherwise to very fine powders, and then thoroughly but carefully mixed together on sheets of paper with the hands or by means of cardboard or horn spatulas.

The mixtures are best packed in capsules or tubes about one inch in diameter and from six to twelve inches long, made of stiff writing paper. Greater regularity in burning is secured by moistening the mixtures with a little alcohol and packing them firmly down in the cases by

## Miscellaneous Formulas

### (Printing Rollers)

means of a wooden cylinder, then drying. To facilitate ignition a little powder (quick match) composed of meal powder 16 parts, niter 2, sulphur and charcoal each 1, loosely twisted in thin paper, is inserted in the top. The tubes are best tied to sticks fastened in the ground.

**Blue Lights.**—Chlorate of potash, 3 oz.; sulphur, 1 oz.; ammonio-sulphate of copper, 1 oz. For colored fires, where the mixtures are ignited in shallow pans and maintained by additions of the powders, the compositions are somewhat different.

**Bengal Fire.**—Sulphur, 4 oz.; meal powder, 4 oz.; antimony, 2 oz.; lamp-black, 16 oz.

**Blue Fire.**—Niter, 8 oz.; sulphur, 2 oz.; sulphate of copper, 4 oz.

**Green Fire.**—Niter, 24 oz.; sulphur, 16 oz.; nitrate of baryta, 48 oz.; lamp-black, 1 oz.

**Green Lights.**—(1) Chlorate of baryta, 2 oz.; nitrate of baryta, 3 oz.; sulphur, 1 oz. (2) Chlorate of potash, 20 oz.; nitrate of baryta, 21 oz.; sulphur, 11 oz.

**Red Lights.**—Nitrate of strontia, 25 oz.; chlorate of potash, 15 oz.; sulphur, 13 oz.; black sulphide of antimony, 4 oz.; mastic, 1 oz.

**Pink Lights.**—Chlorate of potash, 12 oz.; saltpeter, 5 oz.; milk sugar, 4 oz.; lycopodium, 1 oz.; oxalate of strontia, 1 oz.

**Yellow Lights.**—(1) Chlorate of potash, 4 oz.; sulphide of antimony, 2 oz.; sulphur, 2 oz.; oxalate of soda, 1 oz. (2) Saltpeter, 140 oz.; sulphur, 45 oz.; oxalate of soda, 30 oz.; lampblack, 1 oz.

**White Lights.** Saltpeter, 4 oz.; sulphur, 1 oz.; black sulphide of antimony, 1 oz.

**Red Fire.**—Niter, 5 oz.; sulphur, 6 oz.; nitrate of strontia, 20 oz.; lamp-black, 1 oz.

**Yellow Fire.**—Niter, 2 oz.; sulphur, 4 oz.; nitrate of soda, 20 oz.; lampblack, 1 oz.

**White Fire.**—Niter, 16 oz.; meal powder, 4 oz.; sulphur, 8 oz.

### Printing Rollers, Ink, To Clean.

1.—Rollers should not be washed immediately after use, as they will become dry and skinny, but they may be washed half an hour before using again. In cleaning a new roller, a little oil rubbed over it will loosen the ink, and it should be scraped clean with the back of a knife; it should be cleaned this way for about a week, when lye may be used. New rollers are often spoiled by washing too soon with lye.

### (Roller Compositions)

2.—*To Renew a Hard Roller.*—Wash carefully with lye, then apply a thin layer of molasses. Let it stand all night, then wash with water, and let it hang until dry enough to use.

### Printing Roller Compositions.

Rollers for transferring ink to types have to possess special properties, which have reference both to the nature of the ink and that of the type to which it is to be transferred. They must be as little liable as possible to changes of temperature. They must be sticky, but only just sticky enough, and must have elasticity enough to exert a uniform pressure over the varying surface with which they meet in the form. Originally, the composition was one of glue and treacle in varying proportions, and the only practical improvement that has been made is the addition of glycerine. This being slightly hygroscopic, helps to keep the roller at the right degree of softness, and being practically unfreezable, it is of great assistance in keeping the rollers from hardening in cold weather. The invention of this composition, like many other valuable discoveries in connection with printing, is of very uncertain history. As late as 1813 Bacon and Donkin included a mixture of treacle and glue for printing rollers in a patent, but they expressly admit that the composition was at the time employed in printing on porcelain, and it is incredible that the discovery should be centuries posterior to the invention of metallic types. The recipes given in technical works for printing-roller compositions are very numerous, and very different. All, without exception, contain glue and treacle, and it is the practice to put a larger proportion of glue in rollers to be used in the summer than in those intended for winter use. The following is a selection of recipes:

1.—Soak 8 lb. of glue in as much water as it will absorb. When there is no visible water, treat the glue till melted, and add 7 lb. of hot molasses.

2.—(Glue (summer), 8 lb.; glue (winter), 4 lb.; molasses, 1 gal.

3.—Molasses, 12 lb.; glue, 4 lb.

4.—Molasses, 24 lb.; glue, 16 lb.; Paris white, 2 lb.

5.—Glue or gelatine, 64 lb.; water, 48 lb.; linseed oil, 96 lb.; molasses or sugar, 64 to 96 lb.; chloride of calcium, 3 lb.; powdered rosin, 8 lb.

Soak the glue in the water, and then liquify by heat. Then stir in the oil, first heated to 150° F. Then add the



## Miscellaneous Formulas

### (Roller Compositions)

molasses and the chloride of calcium, and finally the fused resin. The latter ingredient is only to be added when very tough rollers are required. This recipe is interesting from the inclusion in it of the hygroscopic salt, chloride of calcium, the object of which is obviously to keep the rollers moist.

6. Molasses, 2 gal.; glue (summer), 8 lb.; glue (winter), 7 lb.; glycerine, 1 pt. Boil the molasses first, by itself, for about  $\frac{3}{4}$  hour, with constant skimming. Then add the hot glue, and boil another  $\frac{1}{4}$  hour. Then add the glycerine, and boil for 5 to 10 minutes longer. This rule of boiling should be observed in all such compositions.

7. Soak glue in as much water as it will absorb; then liquify by heat, and add a weight of glycerine about equal to that of the dry glue.

8. Best glue, 168 lb.; black molasses, or honey, 40 gal.; india rubber, dissolved in turpentine, 16 lb.; Venice turpentine, 2 lb.; glycerine, 12 lb.; vinegar, 4 lb.

9. Glue, 10 lb.; sugar, 10 lb.; glycerine, 12 lb.

The composition is always cast in metal molds, greased inside to prevent adhesion. The best glue should always be used, as a great deal depends upon its quality. A finished roller is tested, after the composition has been applied to the core, by drawing the fingers lightly over it. It should cling to them a little, and an experienced person can judge by the degree of adhesion sufficiently well for all practical purposes. This rule, however, does not apply in the case of a patent composition, in which the property of chromic acid to make gelatine insoluble in water when the two are exposed together to daylight is utilized. This composition is made by adding bichromate to the usual ingredients. The finished roller is varnished with an oil varnish. It is said that such rollers can be inked more quickly than ordinary ones, and can be run at higher speeds. Another patent roller is the felt roller. In this, felt is wrapped over a backing of woolen cloth, on a wooden or metal core, being separated from the backing by means of some impervious fabric, such as oilcloth. The felt itself is soaked with a mixture of tallow and ordinary copal varnish.

10. To 8 lb. of transparent glue add as much water as will just cover it, and occasionally stir it during 7 or 8 hours. After standing 24 hours, and all of the water is absorbed, submit it to the action of heat on a water bath until the glue is all dissolved. Remove from the fire

### (Quicklime)

as soon as froth is seen to rise, and mix with it 7 lb. of molasses, previously made tolerably hot. Stir the composition well together while heating, but do not allow to boil. After being thus exposed to the heat for half an hour, and frequently well stirred, it should be withdrawn from over the fire and allowed to cool a short time, previous to pouring it into a cylindrical mold made of tin, lined sheet iron or copper, having a wooden cylinder previously supported in its center by means of its end pivots or gudgeons. After remaining in the mold at least 8 or 10 hours in winter, and a longer time in summer, the roller is to be taken out of the mold by means of a cord fastened to one of the gudgeons, and passed over a stone pulley fixed to the ceiling. Old rollers are recast in the same manner, first taking care to wash them with a strong alkaline lye, and adding a small quantity of water and molasses. The best mode, however, of making use of the old composition is by mixing it with a fresh batch made of 2 lb. of glue and 4 lb. of molasses.

11. Take an equal quantity of good glue and concentrated glycerine; soften the former by soaking it in cold water, then melt it over a water bath, gradually adding the glycerine. Continue the heat until the excess of water has been driven off, meantime constantly stirring. Cast in brass or bronze molds, well oiled.

12. Strong, medium weather rollers: Cooper's best glue, 84 lb.; extra syrup, 2 gal.; glycerine, 4 pt.; Venice turpentine, 2 oz. Steep the glue in rain water until pliant. Drain it well. Then melt it over a moderate fire, but do not "cook" it. This step in the process takes from 15 to 25 minutes, when the syrup is added, the mixture boiled for  $\frac{3}{4}$  hour, stirred occasionally, and the impurities arising to the surface skimmed off. Add the glycerine and Venice turpentine a few minutes before removing from the fire, and pour into the molds slowly. Slightly reduce or increase the glue as the weather becomes colder or warmer.

### Purple of Cassius.

Purple precipitate, cassius do., gold purple, crystallized protochloride of tin, 1 part; crystallized perchloride of tin, 2 parts; dissolve each separately, mix, and add it to a solution of crystallized tetrachloride of gold, 1 part; wash, and dry the precipitate. Very fine.

### Quicklime, To Preserve.

First put down a layer, 6 to 8 in. thick, of lime that has been reduced by moisture

## Miscellaneous Formulas

### (Rouge)

to powder, on the floor of a bin protected from moisture. On this layer pile lumps of lime, and with suitable pieces of wood ram them as closely together as possible. Then cover this heap, somewhat sloped toward the edges, with a layer of lime moistened on top. The latter, crumbling to powder, will fill up all the interstices between the burned lime, and enclose it so that the unmoistened lime will be protected against the entrance of air and moisture.

### Razor Strop Paper.

1.—Mix the finest emery and finely powdered glass with paper pulp, and make into sheets in the ordinary way. Glue to a strip of wood.

2.—Smooth, unsized paper is rubbed over, after dampening, with a mixture of calcined peroxide iron and emery.

3.—Paper prepared after the following recipe is said to render the use of the razor strop unnecessary. By merely wiping the razor on the paper to remove the lather after shaving, a keen edge is maintained without further trouble. The razor must be well sharpened at the outset. First, procure oxide of iron (by the addition of carbonate of soda to a solution of persulphate of iron), well wash the precipitate, and finally leave it of the consistency of cream. Spread this over soft paper very thinly with a soft brush. Cut the paper into pieces 2 in. square, dry, and it is ready for use.

### Rouge.

*Red Oxide of Iron.*—1.—It is prepared as follows: Make a boiling solution of iron sulphate, filter it, and add to it a concentrated solution of oxalic acid; this throws down yellow oxide of iron. Wash the precipitate, and heat it, while still moist, upon an iron plate, over a charcoal fire. At a temperature of 400° F. the salt is decomposed, and brownish-red peroxide of iron, or rouge, is formed.

2.—The rouge used by machinists, watchmakers and jewelers is a mineral substance. In its preparation, crystals of sulphate of iron, commonly known as copras, are heated in iron pots, by which the sulphuric acid is expelled and the oxide of iron remains. Those portions least calcined, when ground, are used for polishing gold and silver. These are of a bright crimson color. The darker and more calcined portions are known as crocus, and are used for polishing brass and steel. For the finishing process of the specula of telescopes, usually made

### (Seidlitz Powders)

of iron or of steel, crocus is invaluable; it gives a splendid polish.

3.—Others prefer for the production of rouge the peroxide of iron precipitated by ammonia from a dilute solution of sulphate of iron, which is washed, compressed until dry, then exposed to a low red heat and ground to powder.

4.—A rouge suitable for fine work may be made by decomposing a solution of sulphate of iron with oxalic acid, also in solution; a precipitate of oxalate of iron falls, which must be well washed and dried; when gently heated, the salt takes fire, leaving an impalpable powder of oxide of iron.

*Rouge, Stick.*—Stick rouge, as used by the jewelers, is supposed to be made with paraffine as a cementing element, as little as will hold the rouge together.

### Rubber. (See special chapter)

### Screen, Opaque.

Prepare a mixture of gum arabic, 1 part; powdered magnesia, 4 parts; water, 80 parts. In this soak your cotton or linen sheet. On drying, it has a matt and very reflecting surface. In place of magnesia, whiting can be used. If the screen is to be a fixture, all that is necessary is to stretch it on a wooden frame. If it is to be rolled, the upper edge must be nailed to a stout roller, and the lower to a heavy curtain rod. The mixture for the roller screen should contain a little glycerine to give the fabric the necessary suppleness, and to prevent the pigment scaling off when the screen is rolled and unrolled.

### Seidlitz Powders.

*Pulveres Effervescentes Aperientes.*—1.—Potassio-tartrate of soda (Rochelle salts), 2 dr.; bicarbonate of soda, 40 gr.; mix, and put in a blue paper. Tartaric acid, 35 gr.; to be put in a white paper. For about ½ pt. of water. Laxative.

2.—In one bottle: Potassio-tartrate of soda, 12 oz.; bicarbonate of soda, 4 oz.; tartaric acid, 3½ oz.; white sugar, 1 lb. (all in fine powder); dry separately by a gentle heat, add essence of lemon, 1 dr.; mix well, pass the mixture through a sieve, and put it at once in clean, dry bottles. A dessertspoonful or more to a tumblerful of water.

3.—*Limonated Seidlitz Powders.*—This is a highly approved and very palatable form of Seidlitz powder. Powdered tartarated soda, 12 oz.; bicarbonate of soda, 4 oz.; powdered tartaric acid, 3½ oz.; powdered white sugar, 16 oz.; essence of

## Miscellaneous Formulas

### (Show Bottles)

lemon, 30 drops. The powders should each be carefully dried on separate plates, or sheets of paper, and all reduced to a very fine powder. A little gentle heat may be used in drying. Rub the essence of lemon with the sugar, in a mortar, and then pass it through a sieve. First, mix the tartrated soda with the lemon-flavored sugar, then add the bicarbonate of soda, and well mix, and then the tartaric acid, and mix the whole well together in a mortar, and pass once or twice through a sieve to insure a thorough mixture, and bottle in perfectly clean and dry bottles; securely cork, and, if not for immediate use, seal. Perfect dryness is necessary, or the whole will become a solid lump. For use, stir a dessertspoonful in about 1 tumblerful of spring water.

### Show Bottles.

Any color can be deepened by omitting water; i.e., stopping the addition of water when the desired shade is reached. On the contrary, the colors may be lightened by adding more water. Distilled water should be used, and the solutions must not be filtered through paper. It is best to let them deposit; then decant; or, if filtration is desired, then plug the neck of a funnel with glass wool, and strain through that. Organic colors rapidly fade; this applies to aniline colors as well. Rosaniline, magenta, violet and green make pretty shades of solutions, and if one does not object to renewing them once a fortnight, they cannot be improved upon.

*Amber*.—1.—Dragon's blood, in coarse powder, 1 part; oil of vitriol, 4 parts. When thoroughly dissolved, dilute with cold distilled water till the required tint is obtained.

2.—Dragon's blood, 1 part; sulphuric acid, 4 parts; distilled water, 3,629 parts. Powder the dragon's blood, and macerate in the acid for 20 or 30 minutes, then add the distilled water, and filter.

*Blue*.—1.—Distilled water, 920 parts; blue vitriol, 30 parts; alum, 30 parts; sulphuric acid, 20 parts.

2.—Sulphate of copper, 28 parts; alum, 28 parts; sulphuric acid, 26 parts; distilled water, 946 parts. Dissolve the alum and blue vitriol in the water, cautiously add the sulphuric acid, and filter.

3.—Dark Blue.—Sulphate of copper, 10 parts; water of ammonia, 40 parts; distilled water, 950 parts. Dissolve the sulphate of copper in the water, add the ammonia, and filter.

4.—Pale Blue.—Distilled water, 880 parts; sulphate of copper, 120 parts.

### (Show Bottles)

5.—Purple Blue.—Distilled water, 930 parts; aqua ammonia, 64 parts; sulphate of copper, 6 parts.

*Crimson*.—1.—Iodine and iodide of potash, of each, 30 gr.; hydrochloric acid, 1 dr.; water, 1 gal.

2.—Alkanet root, 1 oz.; oil of turpentine, 20 oz.

3.—Solution of chloride of iron, 40 parts; water of ammonia, 27 parts; acetic acid, 59 parts; alcohol, 186 parts; distilled water, enough to make 7,258 parts. Add the solution of chloride of iron to the water, then add the alcohol, acetic acid and water of ammonia, and filter.

*Garnet*.—Bichromate of potash, 1 lb.; sulphuric acid, 16 oz.; water, 2 gal. Dissolve the bichromate in the water, then add the acid gradually, stirring all the time.

*Green*.—1.—Copper sulphate, 2 oz.; sodium chloride, 4 oz.; water, 1 pt.

2.—Solution of verdigris (distilled) in acetic acid, diluted with water.

3.—Dissolve blue vitriol in water, and add nitric acid until it turns green.

4.—Emerald Green.—Nickel, 85 parts; hydrochloric acid, 132 parts; nitrous acid, 55 parts; distilled water, enough to make 4,000 parts. Dissolve the nickel in the hydrochloric acid, and add the water; finally add the nitrous acid, and filter.

5.—Grass Green.—Sulphate of copper, 35 parts; sal ammoniac, 35 parts; water 930 parts. Dissolve the sulphate of copper first in the water, and then dissolve in the solution the sal ammoniac, and filter.

6.—Sea Green.—Acetate of copper, 4 parts; acetic acid, 36 parts; distilled water, 960 parts. Add the acetic acid to the acetate of copper, and triturate with the water, in a mortar, till dissolved; filter.

7.—Olive Green.—Sulphate of copper, 70 parts; hydrochloric acid, 32 parts; subcarbonate of iron, 8 parts; distilled water, 890 parts. Dissolve the sulphate of copper in the water; dissolve the iron in the hydrochloric acid; mix the two solutions, and filter.

*Magenta*.—Acetate of rosaniline, dissolved in water.

*Olive*.—Dissolve equal weights of iron sulphate and sulphuric acid in water, and add copper nitrate, q. s. to strike the color.

*Opalescent*.—Oil of pimento, ½ dr.; rectified spirit, 2 oz.; water, 2 gal. Mix, and expose to the air for a week or so; then filter.

*Orange*.—1.—Dissolve gamboge in li-

## Miscellaneous Formulas

### (Show Bottles)

quor of potassa; dilute, and add a little water.

2.—Bichromate of potassium, 32 parts; nitric acid, 8 parts; distilled water, 960 parts. Dissolve the bichromate of potassium in the distilled water, add the nitric acid, and filter.

*Pink*.—1.—To a solution of cobalt nitrate or chloride, in water, add sesquicarbonate of ammonia, q. s. to dissolve the precipitate at first formed.

2.—From madder (washed with cold water), 1 oz.; sesquicarbonate of ammonia, 1 oz.; water, 3 pt. 12 fl.oz.; digest, with agitation, for 24 hours; then dilute with more water, and filter.

3. Oxide of cobalt, 1 part; nitric acid, 49 parts; distilled water, 950 parts. Add the nitric acid to the oxide of cobalt, let stand till dissolved, then add the distilled water, and filter.

*Purple*.—1.—Sulphate of copper, 2 dr.; water, 2 oz.; French gelatine, 1 dr.; boiling water, 2 oz.; solution of potassa, 2 pt. Dissolve the copper salt in the water, and the gelatine in the boiling water. Mix the two solutions, and add the liquor of potassa. Shake the mixture a few times during 10 hours, after which decant, and dilute with water.

2.—A solution of copper sulphate, 1 oz., in water, 1 qt., with the addition of  $1\frac{1}{2}$  oz. of sesquicarbonate of ammonia.

3.—To the last add a sufficient quantity of the first pink, above, to turn the color.

4.—To an infusion of logwood add carbonate of ammonia, q. s.

5.—Lead acetate, 3 oz.; cochineal, 1 dr.; water, q. s.

6.—Add sulphate of indigo, nearly neutralized with chalk, to an infusion of cochineal till it turns purple.

*Red*.—1.—Solution of perchloride of iron, 10 drops; sulphocyanide of potassium, 10 gr.; water, 1 gal.

2.—Dissolve carmine in ammonia, and dilute with water.

3.—Dissolve cochineal in a weak solution of ammonia; or in

4.—Sal ammoniac, and dilute with water.

5.—Add 4 oz. of sulphuric acid to 1 gal. of water, and digest 8 oz. of red rose leaves in the solution for 24 hours.

6.—Dissolve madder lake in sesquicarbonate of ammonia, and dilute with water.

7.—Take water in which red cabbage has been boiled; add sulphuric acid to bring out the color; dilute with water to the desired tint, and filter.

8.—Cochineal, 6 parts; bitartrate of po-

### (Soda, Silicate of)

tassium, 4 parts; sulphuric acid, 20 parts; distilled water, 570 parts. Boil the cochineal and bitartrate of potassium in water until exhausted; allow to cool, add the sulphuric acid, and filter.

9.—Dark Red.—Alum, 10 parts; iodide of potassium, 10 parts; distilled water, 980 parts. Dissolve the alum and iodide of potassium in the distilled water, and filter.

*Rose*.—Cudbear, 2 oz.; water, 10 oz. Macerate for a day or two, filter, and add to the water till the required shade is produced. Then add to each gallon strong solution of ammonia,  $\frac{1}{2}$  oz.

*Violet*.—1.—Mix together solutions of nitrate of cobalt and sesquicarbonate of ammonia, adding a sufficiency of ammonio-sulphate of copper to strike the required color.

2.—Distilled water, 950 parts; ammonia, 40 parts; cudbear, 10 parts.

*Yellow*.—1.—A solution of sesquioxide of iron (ferrie oxide),  $\frac{1}{2}$  lb., in 1 qt. of hydrochloric acid, diluted with water.

2.—To a strong decoction of French berries add a little alum.

3.—A simple solution of potassium chromate or potassium bichromate.

4.—A solution of equal parts of niter and potassium chromate.

5.—A solution of potassium bichromate.

### Snow, Sham.

The cotton frequently used on Christmas trees to give the effect of snow is extremely dangerous. The very best substance to be used for this purpose is pure white "mineral wool"—*i.e.*, asbestos, when this can be obtained. Otherwise, the cotton should be rendered incombustible; and this object, it is said, can be attained by saturating the cotton with the solution below, and drying: Ammonium sulphate, 8 grams; ammonium carbonate, 2.5 grams; borax, 2 grams; boric acid, 3 grams; gelatine, 9.4 grams; water, 100 grams. The solution should be kept at a temperature of about 39° C.

**Soaps.** (See special chapter.)

### Soda, Silicate of.

1.—Silicate of soda (or soluble glass) is prepared by fusing together carbonate of soda and sand, or by boiling flints in caustic soda under great pressure. It is not soluble in cold water, but dissolves in 5 or 6 times its weight of boiling water. It is employed in the manufacture of soap, in fixing colors, in preserving stones from decay. In admixture with other silicates, silicate of soda occurs in glass; and it, equally with silicate of potassa,

## Miscellaneous Formulas

### (Steel, Burnt)

Imparts the property of viscidty before fusion to such mixtures, which is of great value in the working of glass.

2.—Mix well 200 gr. of fine sand and 600 gr. of fine carbonate of potassa; fuse in a crucible capable of holding 4 times as much. Carbonic acid escapes; the silica and potassa combine and form glass. Pour out the glass, which is commonly termed silicated potassa, on an iron plate. The compound formed in this manner is pure silica soap.

**Solders.** (See special chapter.)

**Staff.**

"Staff," which is so extensively used at all expositions, is a composition of plaster of paris and fiber with some other materials, as alumina, glycerine, dextrine, etc., according to the special casting which is to be made, or the kind of model to be employed. To prevent brittleness, the material is cast around coarse cloth backing, open, and wire cloth is embedded in it for many purposes. The material was first used in the Paris Exposition buildings, in 1878. Its natural color is a murky white, but other colors may be produced by external washes, while the castings may be made to accurately represent cut stone, rock-faced stone, moldings, and the most delicate designs of every kind. For the lower patterns of the walls the material is mixed with cement to make it hard. Gelatine molds are usually used, although where there is no undercut, plaster, wax or sulphur molds may be employed, or wood or metal forms.

### Stamping Powder.

Pigment, 1 oz.; sandarac, 1 oz.; white rosin, 2 oz. The mixture should be passed through a very fine sieve. The pigments preferably employed are Prussian blue, vermilion, chrome green and yellow, white lead.

**Steam Pipes.** (See Boilers.)

### Steel, Burnt, To Restore.

1.—To 4 lb. of fine white pulverized sand add  $\frac{1}{2}$  lb. of sal ammoniac,  $\frac{1}{4}$  lb. of copperas and  $\frac{1}{4}$  lb. of rosin, all pulverized. Mix well. When the steel is hot, sprinkle, and let cool. This process will restore any burnt steel.

2.—Sal ammoniac, 1 lb.; borax, 3 lb.; prussiate of potash,  $\frac{1}{2}$  lb.; rosin, 2 oz. Pulverize; add 2 gills each of water and alcohol, boil to a stiff paste in an iron kettle. The burnt steel is dipped, while hot, in the composition, and hammered slightly.

### (Sweeping Compound)

#### Storm Glasses.

This instrument is not regarded seriously by meteorologists. The following is given with no claims for a scientific instrument. This curious instrument appears to have been invented more than a hundred years ago, but the original maker is not known. It is simply a glass vial about ten inches long and three-quarters of an inch in diameter, which is nearly filled, and hermetically sealed, with the following mixture:—Two drachms of camphor, half a drachm of nitrate of potassium, half a drachm of chlorate of ammonium, dissolved in about two fluid ounces of absolute alcohol mixed with two ounces of distilled water. All the ingredients should be as pure as possible, and each vial filled separately. When the instruments are made in numbers and filled from a common mixture, some get more than the due proportion of the solid ingredients, and consequently such glasses do not exhibit that uniformity of appearance and changes, that undoubtedly should accompany similar influencing circumstances. It is in consequence of a want of precision and fixed principle of manufacture, that these interesting instruments are not properly appreciated, and more generally used. The glass should be kept quite undisturbed, exposed to the north, and shaded from the sun. Camphor is soluble in alcohol, but not in water, while both water and alcohol have different solvent powers, according to the temperature; hence, the solid ingredients being in excess for certain conditions of solution, depending upon temperature chiefly, and perhaps electricity and the action of light also, appear as crystals and disappear with the various changes that occur in the weather.

The changes of the solution signify the following: Clear liquid, bright weather; crystals at bottom, thick air, frost in winter; dim liquid, rain; dim liquid, with small stars, thunder storms; large flakes, heavy air, overcast sky, snow in winter; threads in upper portion of liquid, windy weather; small dots, damp weather, fog; rising flakes, which remain high, wind in the upper air regions; small stars in winter on bright, sunny day, snow in one or two days. The higher the crystals rise in the glass tube in winter the colder it will be.

#### Sweeping Compound. (See also CLEANSING.)

There are several patented compounds for sweeping. They are largely composed of sawdust and silicious material, together with some bonding medium, such as rosin, oil or tar. Bran and sand are also usual ingredients. The following is perhaps as good a formula as any: Melt 2 oz. of paraffine wax in 2 qt. of paraffine oil, over a water bath; then add 6 oz. of coarse salt, 5 lb. of sea sand, 10 lb. of sawdust, and finally add 1 oz. of oil of eucalyptus. It is impossible to see what the oil of eucalyptus is added for, except possibly to give a clean smell.

## Miscellaneous Formulas

### (Textile Fibers)

#### Tapes, Saturating.

Stockholm pitch, 8 parts; wax, 2 parts; tallow, 1 part.

#### Taxidermy, Preparations for.

**Arsenical Soap.**—White arsenic, 2 lb.; white soap, 2 lb.; powdered sugar, 12 oz.; salt of tartar, 12 oz.; powdered chalk, 6 oz.; camphor, 5 oz. Slice the soap, and melt in an earthen vessel, with water, over a gentle fire, keeping it stirred with a wooden spatula. When melted, put in the sugar, salt of tartar and chalk. Remove from the fire, and well stir, and mix in the arsenic. This soap should be kept in a well closed glass or earthen vessel.

**Corrosive Sublimate Solution.** Corrosive sublimate, 1 dr.; spirit of salt, 2 dr.; spirits of camphor, 6 oz. Dissolve the sublimate in the spirits of camphor, and then add the hydrochloric acid. This solution is chiefly used for the skins of quadrupeds, to the inner side of which it is to be applied with a brush or sponge, before stuffing.

**Preservative Powder.**—White arsenic, 2 dr.; corrosive sublimate, 2 dr.; nutgalls, 1 oz.; capsicum, in powder,  $\frac{1}{2}$  oz.; sal ammoniac,  $\frac{1}{2}$  oz.; camphor, in powder, 6 dr.; well mixed together.

#### Textile Fibers, Distinction Between.

A. Remont communicates a short process to detect or separate these fibers, which may suffice for ordinary purposes. The fabric to be examined is first dipped for 15 minutes in boiling water containing 5% of hydrochloric acid, for the purpose of removing coloring matter and sizing; it is then washed and dried. If at all possible, the wool is then to be separated from the warp, and each examined separately, according to the following scheme:

A. Burn a few fibers.

An odor of burnt urine is developed. If this is the case, heat a few fibers with solution of soda, and examine the vapor given off; if ammonia is present, this indicates the presence of an animal fiber.

B.—Dip a few fibers into a boiling solution of basic chloride of zinc.

a.—The fiber dissolves completely.—Silk.

b. On the addition of hydrochloric acid an abundant flocculent precipitate is produced.—Silk mixed with wool or vegetable fiber.

c.—The chloride of zinc does not dissolve it. Remove the fibers to a boiling, moderately dilute solution of soda.

### (Tobacco)

It dissolves completely.—Wool.

It dissolves partially.—Wool and cotton.

2.—No odor of burnt urine is developed.

---Vegetable fiber.

#### Thread Sewing, Dressing for.

1.—For colored thread: Irish moss, 3 lb.; gum arabic,  $2\frac{1}{2}$  lb.; Japan wax,  $\frac{1}{2}$  lb.; stearine, 185 grams; borax, 95 grams. Boil together for  $\frac{1}{4}$  hour.

2.—For white thread: Irish moss, 2 lb.; tapioca,  $1\frac{1}{2}$  lb.; spermaceti,  $\frac{3}{4}$  lb.; stearine, 110 grams; borax, 95 grams; boil together for 20 minutes.

3.—For black thread: Irish moss, 3 lb.; gum Senegal,  $2\frac{1}{2}$  lb.; ceresine, 1 lb.; borax, 95 grams; logwood extract, 95 grams; blue vitriol, 30 grams; boil together for 20 minutes. Soak the Irish moss, in each case, overnight in 45 l. of water, then boil for 1 hour, strain, and add the other ingredients to the resulting solution. It is of advantage to add the borax to the Irish moss before the boiling.

#### Tobacco.

**Cigarettes, Scenting.**—Take lign. santal flav., 1 oz.; cort. cinnamonis, 1 oz.; flor. lavand., 2 oz.; caryophylli,  $\frac{1}{4}$  oz.; mix.

**Cigars.**—1.—Artificially Matured.—Boxes of cigars are laid on a grating or gridiron over a trough or vessel containing calcium chloride in powder, or ferrous chloride, or other substance possessing a strong attraction for water. A few sheets of blotting paper are placed at the bottom of the trough to absorb the moisture, and the boxes are closed. The damp air in the boxes draws the moisture out of the cigars, which are quickly matured by this process.

2.—Flavors for.—a.—For flavors, the following are those most generally employed: Orris, 4 dr.; vanilla, 4 dr.; tonka, 4 dr.; alcohol, 8 fl.oz.; water, 4 fl.oz. Make a tincture.

b.—Cascarilla, 12 dr.; valerian, 4 dr.; alcohol, 8 fl.oz.; water, 4 fl.oz. Make a tincture.

c.—Cascarilla, 4 dr.; orris, 4 dr.; elecampane, 4 dr.; alcohol, 8 fl.oz.; water, 4 fl.oz. Make a tincture.

d.—Tonka, 4 dr.; orris, 4 dr.; valerian, 4 dr.; alcohol, 8 fl.oz.; water, 4 fl.oz. Make a tincture.

e.—Havana stems, 1 troy oz.; orris, 4 dr.; tonka, 4 dr.; alcohol, 8 fl.oz.; water, 4 fl.oz. Make a tincture.

To use these tinctures, dilute them with a mixture of 1 part of water and 2 parts of alcohol, using 3 parts of the diluent to 2 parts of the tincture. The liquid is

## Miscellaneous Formulas

### (Tobacco)

applied as a spray; 1 oz. of the tincture should suffice for 5 lb. of tobacco leaves.

3.—Spots on.—The imitation of the spots which are natural to Cuban leaf tobacco seems to be a piece of information very much in demand, probably from the scarcity of the genuine article. Into an earthen or enameled vessel put 3 parts of sodium carbonate; pour over it 8 parts of boiling water, let boil until solution takes place, and then add 1 part of calcium chloride; let cool, and pour into earthen or stoneware jugs, cork tightly, and seal securely, to prevent the escape of gases. Keep in a cool place. Either Labarraque's solution or javelle water of commerce answers the purpose admirably.

#### *Havana Flavor for American Tobacco.*

—In the government factories of France, where tobacco in all of its forms is a monopoly of the state, the following is the method of treating common American tobacco to give it a Havana flavor: The tobacco is first soaked from 6 to 12 hours, according to its rankness, in tepid or hot water. This is to dissolve out and remove a gummy substance that gives the tobacco its offensiveness. While macerating, the leaves are frequently stirred, or gently squeezed by suitable machinery, and the water is changed as often as may be necessary to facilitate the process. After soaking, it is gently pressed out, rinsed and dried. After drying, it is treated with an infusion of the stems and ribs of genuine Havana tobacco, either by sprinkling or by immersion and maceration, according to the uses to which the finished product is to be put. If it is to be used for cigars, it is treated with one or the other of the following formulae:

1.—Fluid extract of valerian, 1 part; tincture of tonka bean, 8 parts; 94% alcohol, 23 parts. Mix.

2.—Tincture of valerian, 3 parts; butyric aldehyde, 4 parts; tincture of vanilla, 2 parts; ethyl nitrite, 1 part; 94% alcohol, 40 parts; water, q. s., 128 parts. Mix.

*Tobacco Leaf, To Spot.* Finely powdered ammonium carbonate, 2 av.oz.; solution of hydrogen peroxide, 16 fl.oz. Place the ammonium carbonate in a shallow dish, and pour upon it the hydrogen peroxide solution; effect a solution of the salt by stirring, and by the use of a small whisk broom scatter the mixture upon the leaf, and let dry. Care must be taken that the hydrogen peroxide solution is of full strength.

Tobacco, its manufacture, chemistry, curing, etc., are treated of in our Scientific

### (Wax)

fic American Supplement, Nos. 954, 1344, 1345 and 1560.

**Toilet Preparations.** (See special chapter.)

#### **Touch Paper.**

Soak blotting paper, or other unsized paper, in a 10% solution of potassium nitrate. Drain, and dry perfectly.

#### **Turpentines, Substitutes for.**

1.—Best refined rosin spirit, 1 part; heavy benzoline, 1 part; turpentine, 2 parts.

2.—Naphtha (coal tar), 1 part; petroleum spirit, sp. gr. 0.790, 2 parts; turpentine, 1 part.

3.—Turpentine, 1 part; petroleum spirit, sp. gr. 0.790, 1 part; rosin spirit, 1 part; coal-tar naphtha, 1 part.

4.—*Venice Turpentine*.—a.—Rosin, 17 oz.; boiled linseed oil, 12 oz.; oil of turpentine, 8 oz. Mix.

b.—Rosin, 12 lb.; oil of turpentine, 1 gal. Mix.

#### **Tutty Powder.**

Impure oxide of zinc. A substance which collects in the chimneys of the furnaces in which the ores of zinc are smelted.

#### **Violin Strings.** (See Catgut.)

#### **Wastes.**

Valuable data on the Utilization of Many Industrial Wastes is contained in our Scientific American Supplement Nos. 1402, 1403, 1404, 1405, 1540, 1591, 1610, 1626, 1655, 1657, 1660, 1671, 1672, 1685, 1687, 1690, 1723, 1724, 1736, 1742 and 1765.

#### **Waterproofing.** (See special chapter.)

#### **Wax.**

Bees wax bleaching, testing, etc., are treated of in our Scientific American Supplement, Nos. 867, 942 and 1145.

*Dentists' Molding Wax.*—Stearine, 25 parts; half soft copal, 25 parts; talc, 50 parts; carmine, 0.5 parts; oil of rose geranium, 2 drops to 1 oz. Melt the rosin by the heat of a sand bath, and when slightly cooled add the stearine, stirring constantly. When this has melted add the other ingredients, previously intimately mixed, and stir so that a homogeneous product may be obtained. The adhesiveness of the composition may be increased or diminished by modification of the amount of copal. A more thorough blending of the color may be insured by dissolving the carmine in a little potash solution before mixing with the chalk.

*Scaling wax.* (See WRITING MATERIALS.)

## Miscellaneous Formulas

### (Whalebone)

**Sheet Wax.**—1.—Dr. H. E. Beach, Clarksville, Tenn., says: Take of pure, clean wax, anywhere from 1 to 5 lb., put in a tin bucket or any deep vessel, with clear water sufficient to fill it within 2½ in. of the top. Set on the stove till thoroughly melted, then set aside until partially cooled; skim all the air bubbles off. Then fill a smooth, straight bottle with ice-water, a bucket of which you should have by you. Soap the bottle, and dip it deliberately in the solution two or three times, according to the thickness you desire your wax. After the last dip, as soon as the wax hardens to whiteness, cut a line through it and remove it from the bottle as quickly as possible. Spread to cool, and straighten out smooth while warm. Continue this process until all the wax is made into sheets.

2.—Melt scrap wax in hot water, and add sulphuric acid, 30 minims to each pound of wax. Boil for 2 or 3 minutes. Cool, and remove impurities from base of cake; boil again, and add a few drops of turpentine. When the liquid ceases to foam the wax is ready for rolling into sheets. Stretch wires of suitable thickness across a glass plate to form molds of desired size. Wet a glass rolling-pin, and coat with soapstone. Pour the melted wax into the molds and pass the roller firmly over the wires.

### Whalebone.

To polish whalebone it is scraped with steel scrapers, or pieces of window glass, rubbed with emery paper, and then with woolen cloth supplied with tripoli or rotten stone. The polishing lathe is also used for whalebone, which is then treated like horn or tortoiseshell.

**Artificial Whalebone.**—1.—This material is easiest made from raw animal skins. These are first treated with sulphide of sodium and the hair removed. The skin thus prepared is placed for 24 to 36 hours in a weak solution of bichromate of potash. To dry the skin thus prepared, it can be stretched or tacked on a frame, a flat plate, or any similar contrivance, so that in drying the skin cannot shrink, and to insure its drying as flat as possible. On these frames the skin, exposed to the effect of daylight, is dried, at first slowly, and then exposed to a temperature of 122 to 140° F. The action of the daylight, in combination with the bichromate of potash the skin now contains, makes the glue present in the skin cells insoluble in water, and prevents the occurrence of putrefaction, while the vigorous drying removes the mois-

### (Whalebone)

ture from the innermost core of the leather. The dried skin is then compressed under very heavy pressure, and the material thus obtained possesses a hardness and elasticity closely approaching that of the genuine whalebone. This material, before or after drying, can, by coating, or immersion in a bath of color, be colored as desired in order to impart to it the color of the natural whalebone. It is made better capable of resisting moisture by coating or impregnation with rubber, varnish, lacquer, or similar substances. Where rubber is used, it can be either applied directly or in the form of a casing or covering, drawn over each piece or rod. The separate rods may also be protected from moisture by inclosure in waterproof paper or waterproof fabric. This artificial whalebone can also be made from more or less tanned leather, which, for this purpose, is treated like the untanned skin. When the artificial whalebone is completed it is cut into plates of any desired length and width. The product may also be given a rounded form by pressing.

2.—Ordinary rattan is freed from its smooth, glazed exterior covering in a special machine, and by means of a decoction of Campeachy wood and an iron stain, dyed black. When dry it is saturated with a solution of caoutchouc, gutta percha and sulphur in coal-tar oil. After this the rods are steamed in a steaming apparatus under a pressure of 2 atmospheres, whereby the mixture with which the cane is impregnated is thoroughly hardened (vulcanized), and finally they are passed between rollers whereby they are made absolutely dense and highly elastic.

3.—Caoutchouc, 1 part; shellac, 0.2 part; magnesia, 0.2 part; sulphur, 0.25 part; golden sulphur, 1.25 parts. The caoutchouc (india-rubber) must be cut up very fine and then kneaded in with the other ingredients at a steadily rising temperature, which, however, must not be allowed to rise above 284° F. Rattan, split into fine strips, is treated in the hot mixture for several hours.

4.—Cane strips, saturated with a solution of nitrate of iron, Campeachy wood and vitriol, treated with linseed-oil varnish, and finally polished.

5.—Suitable fibers, such as piassara, alfa, Mexican fiber, etc., are saturated with a solution of silicate of soda, either alone, or mixed with baryta, felspar or chalk, or with any glue, cement, gum, etc. The mass is cut into strips and dried. Hereupon it is covered with a coating that



## Miscellaneous Formulas

### (Wood Preservation)

dries in the air, such as glue, shellac, celluloid, etc., also with caoutchouc solution, copal, etc.; finally it is wound spirally with a covering of silk, cotton, flax, etc. For brushes or brooms, the thin, short fibers are used, which are saturated with a rosin solution.

#### Whisky.

The distillation of whisky and other beverages of high alcoholic content is prohibited by the Volstead Act and therefore no data as to distillation can be given.

#### Wood, Preservation of.

1.—The improved French method of preserving wood by the application of lime is found to work well. The plan is to pile the planks in a tank, and to put over all a layer of quicklime, which is gradually slaked with water. Timber for mines requires about a week to be thoroughly impregnated, and other wood more or less time, according to its thickness. The material acquires remarkable consistency and hardness, it is stated, on being subjected to this simple process, and the assertion is made that it will never rot. Beechwood prepared in this way for hammers and other tools, for ironwork, is found to acquire the hardness of oak, without parting with any of its well-known elasticity or toughness, and it also lasts longer.

2.—Nicholson, noting that railway sleepers lying on ground which had formerly been the bed of a salt lake, in Nebraska, retained their power to resist decay for an unusually long time, and showed an excess of alkaline salts in their ash, suggests that here is a cheap and effective preservative.

3.—Lostal, a French railway contractor, recommends the use of quicklime for preserving timber. He puts the planks in tanks, and covers them with quicklime, which is gradually slaked with water. Timber such as is used in mines takes about a week to become thoroughly impregnated. The wood acquires a remarkable hardness and toughness, and, it is said, will never rot. Beechwood has been prepared in this way for hammers and other tools in several ironworks, and is reported to have been as hard as oak, without losing its peculiar elasticity.

4.—Wood will be effectually preserved from the action of the air if it is covered by a paint brush with a solution of persulphate of iron, marking 2 to 2½° B. The blue tint which is developed by drying changes to brown when a coat of linseed oil is laid on.

5.—Lay timber up, when perfectly dry,

### (Wood Preservation)

in an airy place, that it may not be exposed to the sun or wind, and taking care that it does not stand upright, but let it be laid along, one piece upon another, interposing here and there some short blocks, to prevent that moldiness which is usually contracted when planks sweat. Lay the planks in a stream of running water for a fortnight, and then set them up in the sun and wind, so that the air may freely pass between them, and turn them frequently. Boards thus seasoned will floor much better than those which have been kept in a dry place for many years. Elm, felled ever so green, if kept for four or five days, obtains a good seasoning, and is rendered fit for immediate use. This water seasoning is not only a remedy against the worm, but also prevents distortions and warping. Where huge massy columns are to be used, it is a good plan to bore them through from end to end, as it prevents their splitting. Timbers occasionally laid in mortar, or any part contiguous to lime, have sometimes been capped with melted pitch as a preserver from the destructive powers of lime; but it has been found to be rather hurtful than otherwise.

6.—For the purpose of preserving timber for mines, Koug packs the timber, cut in proper lengths, in a vertical position in an iron reservoir, provided with a tight-fitting cover. The vessel is then filled to about three quarters of its capacity with a solution of the carbonate of soda. Into this he leads live steam, which speedily brings the liquid to the boiling point. The access of the steam is continued until by its gradual condensation it has filled the vessel to its full capacity. The wood is then allowed to remain in the hot liquid some hours; this is drawn off, and the wood washed off with a dry steam jet.

7.—Hock dissolves paraffine in ligroin, so-called petroleum ether, kerosene, or other convenient substances, and immerses the wood to be preserved in the solution, care being taken that the wood is as dry as possible. After impregnation the saturated wood is heated in a large retort, provided with a condensing arrangement, whereby the volatile solvent is expelled and condensed for use over again, while the paraffine is left in the pores of the timber. Crude paraffine (containing much liquid hydrocarbons) may be employed.

8.—At Bellagio, on the lake of Como, where olive wood is used in large quantities for the formation of various articles of turnery, the plan adopted for season-

## Miscellaneous Formulas

### (Wood Preservation)

ing the wood is to boil it for about 10 minutes and then let it dry gradually for months before using it.

9.—A good preservative against dry rot is the following: Oil of cassia, 1 part; wood tar, 1 part; train oil, 1 part. Apply three coats on the reverse sides and on the ends of planks, floors, etc. In all probability, oil of cassia plays the chief role as preservative.

10.—During the excavation of a canal in Berlin the workmen struck upon 12 perfectly preserved coffins, which lay apparently in 4 graves, each containing 3 superimposed coffins. The site of the discovery corresponds with the cemetery that existed even as late as 1620 in connection with the poor house and pestilential hospital. The corpses must, in consequence, have been in the earth for at least 260 years. Notwithstanding this long period, the coffins, as well as their contained bones, were in a perfect state of preservation; articles of clothing were even found still clinging to some of the bones. Professor Virchow found, upon investigation, that the coffins were coated on both sides with a thick layer of tar, the wood itself appearing to be young oak, 1 in. in thickness. A silicious crust was likewise found on the inner side of the coffins. The wood was so hard that axes and saws were broken in an attempt to cut it.

11.—Jacques first impregnates the timber thoroughly with a simple solution of soap mixed with an acid—preferably phenic acid. This causes the formation in a few days, within the wood, of a fatty acid, which is insoluble in water, and impregnates the remotest fibers. The reaction of the acid on the soap does not take place until a portion of the water has evaporated. It is claimed that more perfect impregnation can be had in this way than with creosote, and there is no danger of the washing out of the preservative from the exposed surfaces, as when sulphate of copper is used. The government commission on technical railroad operation in France is said to favor this process.

12.—Card impregnates the wood with a solution of zinc chloride or other antiseptic soluble mineral salt, then dries the outer layers of the wood by heated air currents, and finally saturates with hot creosote oil. The creosote oil is to prevent the soluble antiseptic from being washed out.

13.—Richard uses common salt in a chemically pure crystallized form, as the most efficacious preservative of timber.

### (Wood Preservation)

In combination with alum, absolute incombustibility, it is said, can be insured by its use.

14.—Müller employs for the preservation of wood the phosphate of baryta formed within the filter. The wood is first steeped in a solution of the phosphate of soda containing 7% of the salt. When dry, the wood is again treated with a solution of chloride of barium containing 13%.

15.—Leech takes 1 lb. of arsenious acid and dissolves it in 4 gal. of water; to this he adds 1 lb. of carbonate of soda, stirring the mixture till it is thoroughly dissolved. In a separate vessel he makes a solution of 16 lb. of sulphate of copper in 16 gal. of water, mixes the solutions together, and places them in a wooden or lead-lined vat. The timber is placed in this bath, and the solution heated by means of steam to the boiling point. A few hours' soaking is said to be sufficient, but when heat is not applied the wood must remain for at least 2 or 3 days. These solutions are applicable to wood that is already in permanent position, as telegraph poles, fences and gates. In these, and similar cases, one solution should be painted on, and allowed to dry before the other is applied. When possible, they should be laid on hot.

16.—Mewburn's process, so far as oak is concerned, consists simply in boiling the wood in a solution of gallo-tannic acid, the proportions of the respective ingredients being apparently immaterial. The result is the formation of an insoluble substance in the pores of the wood. One solution only is necessary for oak, on account of the tannin naturally present in that wood, the endurance of which in moist situations is proverbial. A consideration of this fact led Hatzfeld to try the effect of impregnating timber with tannin, and afterward with acetate of iron, a process which is both cheap and useful, and which is at present being tested by a telegraph company in France.

17.—Posts and pier piles can be rendered nearly indestructible by boring one or more holes, larger or smaller, in the center of the butt, the whole length, if desirable; then fill with boiling coal tar and close the aperture with a long taper wedge, well driven home, which will give pressure to force the antiseptic into the inner heart pores of the mold. Were posts thus preserved, and the exterior surface dressed with rosin varnish, they would last for centuries. Wood exposed to the air should not be dressed with coal tar, but Stockholm tar or resinous var-

## Miscellaneous Formulas

### (Wood Preservation)

nish; the former will rot the fibers when exposed to sun and air. Mark the posts at 6 or 8 in. above the depth they are to be placed in the earth, and bore the hole up to the mark. Then fill in with boiling coal tar, plug up the hole, and the base of the post will outlast the upper part. The writer has also had occasion to stand posts under floor joists, as a support, when by making a clay puddled hole, and pouring into it 1 gal. of boiling coal tar as a bed for the post to stand in, it would never decay.

18.—Wood is rendered extremely durable and weatherproof by covering it with hot linseed-oil varnish, several coats being applied, each one after the preceding one is dry; finally oil colors are applied as required. The drying requires a longer time than the ordinary process of painting.

19.—Melsens impregnated blocks of wood with tar by alternate heatings and coolings; they were then kept two years in a corner of a garden, in earth saturated with the products of a urinal, and were unaltered; on breaking across it was found that lines were noticeable where the tar had not penetrated completely; the one set of split halves were kept some years in ordinary earth, the others carefully preserved; they were then steamed at 212° F. (100° C.) for 12 hours, quickly cooled in water, frozen, and left out in the open air all winter, at the end of which time they were unaltered. They were then placed in a wet situation in a garden, then on an isolated building, and then in a sandy soil under a rain-water tub. Finally, after 20 years' exposure to varied deteriorating agencies, no change whatever was produced in them. By utilizing the mechanical force of condensing steam, or of the atmosphere, wood may be wholly or partially injected with tar, or other preservative agents; when not preserved, the natural course of decay is along the direction of growth, and not across it; the direction in which the preservative body is forced into the wood is the same. When the wood is only superficially injected it is desirable that it should be shaped into the required form before applying the preservative process.

20.—The value of creosote as a wood preserver is generally recognized, but the direct injection requires great quantities of heavy oil and a desiccation of the injected pores. The high boiling point of creosote does not permit its employment in vapor. Blythe formed the idea of saturating a jet of steam with creosote in minute division, forming, so to speak, a

### (Wood Preservation)

gaseous emulsion. The apparatus comprises a high-pressure steam boiler; another boiler containing creosote, in which the steam is saturated; a vat, filled with creosote, to be pumped into the boiler; sheet-iron cylinders, for the pieces which are to be injected; and a system of tubing connecting the several parts. In this way Blythe completely fills the heart of oak, pine, or red beech; he uses 4 to 6 lb. of creosote for a cross-tie, and 4 lb. of brown phenic acid per cubic yard of saturated wood, or cross-ties. The apparatus can prepare 500 ties per day. The wood comes out softened, so that it can readily be bent or shaped, but it rapidly hardens. At first it shrinks, but after a few weeks it becomes seasoned, and resists the influence of moisture. Finally, the fibers are greatly strengthened.

21.—*Ants and Insects in Woods, To Destroy*.—a.—Corrosive sublimate is an effectual poison to them.

b.—Oils, especially essential oils, are good preventives.

c.—Cajeput oil has been proved effectual for destroying the red ant.

d.—Payne's, Bebbell's and Burnett's processes are said to be proof against the white ant of India.

e.—Dust the parts with pounded quicklime, and then water them with the ammoniacal liquor of gas works, when the ammonia will be instantly disengaged by the quicklime, and this is destructive to insect life.

f.—For the black ant, use powdered borax; or smear the parts frequented by them with petroleum oil; or syringe their nests with fluoric acid or spirits of tar, to be done with a lenden syringe; or pour down the holes boiling water to destroy their nests, and then stop up the holes with cement. Ants dislike arsenic, camphor and creosote.

22.—*Burnettizing*.—A solution of 1 lb. of chloride of zinc to 4 gal. of water, for timber, and 1 lb. of chloride of zinc to 5 gal. of water for canvas, cordage, etc., in a wooden tank. These were the proportions originally specified; 1 lb. of the salt to 9 or 10 gal. of water are now more frequently used. Timber requires to be immersed for about 2 days for each in. in thickness, and afterward taken out and left to dry for about 14 to 30 days. Canvas, ropes, etc., require to be immersed in the solution for about 48 hours, then taken out and dried. The process on wood may be more expeditiously performed by forcing the solution into the pores with a pressure of 150 lb. to the square inch. The advantage of

## Miscellaneous Formulas

### (Wood Preservation)

this process is that it renders the material to which it is applied incombustible.

23.—*Dampness, To Preserve Woods that Are Exposed to.*—a.—For those of an extensive nature, such as bridges, etc. The Hollanders use for the preservation of their sluices and floodgates, draw-bridges and other huge beams of timber exposed to the sun and constant changes of the atmosphere, a certain mixture of pitch and tar, upon which they strew small pieces of shell, broken finely—all most to a powder—and mixed with sea sand and the scales of iron, small, and sifted, which incrusts and preserves it effectually.

b.—A paint composed of sub-sulphate of iron (the refuse of the copperas pans), ground up with any common oil, and thinned with coal tar oil, having a lit the pitch dissolved in it, is flexible, and impervious to moisture.

c.—Linseed oil and tar, in equal parts, well boiled together, and used while boiling, rubbed plentifully over the work while hot, after being scorched all over by wood burnt under it, strikes  $\frac{1}{2}$  in. or more into the wood, closes the pores, and makes it hard and durable either under or out of water.

d.—For fences, and similar works, a coating of coal tar, sanded over; or boil together 1 gal. of coal tar and  $2\frac{1}{2}$  lb. of white copperas, and lay it on hot.

24.—*Dry Rot, To Preserve from.*—a.—

### (Wood Preservation)

The best way to preserve a timber exposed to the action of the weather is to force into the pores of well seasoned wood as much carbolic acid, or creosote, as possible. This soon resinifies, and most effectually prevents the timber from dry rot and decay. On a large scale, as for railway sleepers, expensive appliances are needed; but for barns or outbuildings it may be applied to considerable advantage by the use of a paint brush.

b.—The following recipe is said to be a cure for dry rot: Melt 12 oz. of rosin in an iron pot; add 3 gal. of train oil and 3 or 4 rolls of brimstone; when it is thin add Spanish brown, or red and yellow ochre, or whatever color preferred; put on the wood hot, and thin with a brush; give two coats.

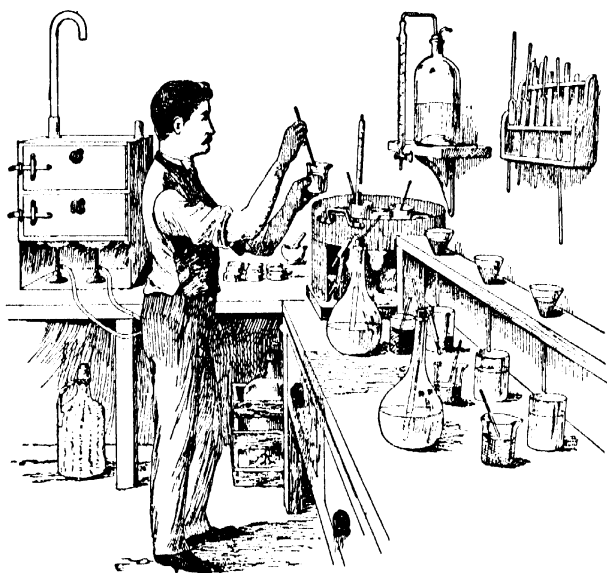
c.—To cure incipient dry rot, if very much affected, remove the timber and replace with new.

d.—A pure solution of corrosive sublimate in water, in the proportion of 1 oz. to 1 gal., used hot, is considered a very effectual wash.

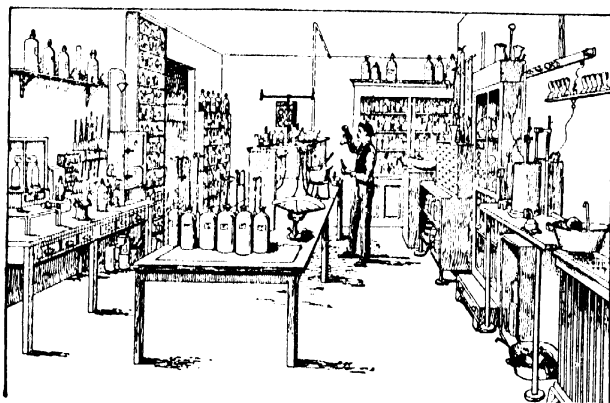
e.—A solution of sulphate of copper,  $\frac{1}{2}$  lb. per gal. of water, laid on hot.

f.—A strong solution of sulphate of iron. This is not so good as sulphate of copper.

g.—A strong solution of sulphates of iron and copper, in equal parts,  $\frac{1}{2}$  lb. of the sulphates to  $\frac{1}{2}$  gal. of water.



Chemical Operations are Best Carried on With Proper Equipment



A Modern Laboratory Equipped for Analytical Work

1978

## CHEMICAL MANIPULATIONS

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The proper preparation and manipulation of chemical and other substances is of paramount importance and much of the non-success of amateurs may be laid to this lack of knowledge. Much of the apparatus required can be constructed at home, but glassware of convenient shapes should be purchased from dealers in chemical apparatus. It will pay in the long run to have good supplies from reliable houses. A fairly good little laboratory for making various articles given in the formulas would cost from \$50.00 to \$100.00. Of course, where the manufacture of an article is to be carried on commercially a special plant is needed, much of which can be supplied by the chemical supply houses noted above. A request to the publishers of this book will bring a list of dealers in such lines. Addresses must necessarily be excluded in a work of reference which is of permanent value. A catalogue of chemicals should be at the right hand of all experimenters. The number of rare things hard to get at the ordinary drug store which they carry is very considerable, such as agar agar, alizarin, aloes, amber, aniline colors, animal charcoal, aqua regia, asbestos, Canada balsam, banana oil, barium, Brunswick black, Burgundy pitch, etc., to only enumerate a few titles out of the first two letters of the alphabet. The prices of a few are noted a little further on. So far as possible always strive to deal with these chemical houses, as this will insure good materials, without which no success is possible. Until you wish to make an article on a commercial scale always buy the most expensive and best materials; after success has been obtained it is fairly safe to use cheaper materials if the skill which has been attained is sufficient to make a superior product with more economical raw materials.

The entire subject of manipulation has been divided as follows:

### LABORATORY OPERATIONS

I COMMINUTION	III VAPORIZATION
SLICING	EVAPORATION
RASPING	DISTILLATION
CONTUSION	
GRINDING	
PULVERIZING	
TRITURATION	
PORPHYRIZATION	
SIFTING	
LEVIGATION	
GRANULATION	
ELUTRATION	
PULVERIZATION BY INTERVEN-	
TION	
II SOLUTION AND EXTRACTION	IV PRECIPITATION AND SEPARATION
EXPRESSION	PRECIPITATION
MACERATION	STRAINING
DECOCTION	CLARIFICATION
INFUSION	CENTRIFUGATION
DIGESTION	WASHING
DESSICATION	DECANTATION
	PERCOLATION
	FILTRATION
	PRECIPITATION
	CRYSTALLIZATION
	GRANULATION
	DIALYSIS
	DECOLORIZATION
	EMULSIFICATION

Always consult the index when using this book.

# Chemical Manipulations

(Classification)	(Technical Substances)
V	
HEAT TREATMENT OF SOLIDS	CARBONIZATION
IGNITION	REDUCTION
FUSION	TORREFACTION
CALCINATION	INCINERATION
ROASTING	SUBLIMATION
DEFLAGRATION	VI
DECREPITATION	SPECIFIC GRAVITY

The following list, which numbers about 800 substances, is intended to answer the myriad of questions of price which have been so often asked the editor. The list does not take in either the ordinary or extraordinary chemicals of commerce, either medical or technical, more or less complete lists of which can be consulted at any druggist's, but the list does take up the flotsam and jetsam of technology, and it is thought that it would be handy to have prices on articles such as agar agar, aniline colors, essences, bay leaves, fluorspar, fusible metal, nickel anodes, oyster shells, pipe clay, mineral wool. Every user of this book is earnestly requested to obtain a full list of drugs and chemicals issued by any one of four or five prominent dealers in chemicals. The lists include many thousand articles and they are so valuable that the catalogues of all the dealers should be bound together for reference. Most dealers expect 5 or 10 cents for postage on their catalogues. It should, of course, be remembered that fluctuations in the price of articles listed are apt to be *quite considerable*, yet no one will be seriously misled if catalogues of dealers are *kept on file* as suggested. These fluctuations will hardly take away from the value of the list. The list was compiled from five catalogues and contains perhaps a wider range of subjects than can be found in any one of them. Of course a list of acids in any one of them, for instance, is very extensive, as is also all of, say, the sodium preparations, which may easily number over 150 different chemicals and states of purity. The same might be said of almost any important chemical.

It should be noted that all bottles, cans, and in fact all containers, are charged for, as well as packing cases if any are required. The postal laws exclude from the mail poisons, glass, explosives, spontaneously combustible chemicals or any other matter liable to injure or deface the contents of the mail. Strong acids, phosphorus, potassium, sodium or other articles considered dangerous by the carriers **on account either of inflammability or**

liability to cause injury to other freight are refused conveyance by the express companies, but can be shipped by freight lines.

	Per oz.	Per lb.
Agar agar .....	\$0.10	\$0.75
Threads .....	..	.85
Powder .....	.20	1.85
Sticks .....	.10	1.00
Albolene:		
Solid .....	..	.40
Liquid .....	..	.40
Albumen:		
From eggs .....	.10	.90
From blood .....	.10	.35
Alizarin:		
Paste, 20% .....	.10	.60
Assistant (Turkey red oil) ..	.10	.50
Alkanet root .....	..	.25
Almonds:		
Bitter .....	..	.37
Sweet .....	..	.35
Jordan .....	..	.35
Flour .....	..	.40
Aloes, Socotrine .....	.10	.40
Alum, burnt or calcined .....	..	.15
Aluminum:		
Bars .....	..	.75
Foil .....	.20	..
Sheet .....	..	1.50
Wire .....	.20	..
250-leaf book—\$1.25.	..	..
Leaf bronze .....	..	1.15
Amalgam:		
Electric .....	.12	.75
Copper .....	.25	2.85
Of sodium .....	.20	1.50
Tin-zinc .....	.30	4.80
Zinc .....	..	.60
Amber:		
Crude .....	.06	.50
Clear .....	..	1.25
Ambergris, black, \$3.50 dram; gray, \$4.50 dram.	..	..
Amyl acetate .....	..	.80
Aniline oil .....	.05	.30
Aniline C. P. ....	.19	1.00

NOTE.—These prices are now very much higher in nearly every case owing to advances in drugs, chemicals and technical substances.

# Chemical Manipulations

(Technical Substances)			(Technical Substances)		
	Per oz.	Per lb.		Per oz.	Per lb.
<b>Aniline Colors:</b>			<b>Balsam (continued)</b>		
Black, soluble in water			Fir .....		.30
(Nigrosine) .....	.20	1.25	Peru .....	\$0.35	
Blue, soluble in water .....	.15	1.50	Tolu .....	.10	\$0.45
Blue, red shade .....	.15	1.75	Banana oil (Lacquer)—qt. 50.		
Blue, gentian .....	.40		Barium, metallic—Gram, \$12.		
Blue, Lyons .....	.25				Per lb.
Blue, methyl .....	.30	1.75	<b>Barks:</b>		
Blue, methylene .....	.35		Angostura (Galipea cusparia) ..		\$0.60
Blue, navy .....	.20	1.75	Barberry (Berberis vulgaris) ..		.35
Brown, Bismarck .....	.20	1.00	Bayberry (Myrica cerifera) ..		.25
Chrysoidine, orange .....	.15	1.25	Birch (Betula lenta) .....		.20
Coralline .....	.20	1.75	Butternut (Juglans cinerea) ..		.25
Green, emerald .....	.15	1.25	Cinnamon (Cassia cinnamomum) ..		.25
Orange .....	.20	1.50	Ceylon (Cinnamomum zeylanic) ..		.40
Red, Congo .....	.20	1.75	Clove (Cassia Caryophyllata) ..		.40
Red, eosin .....	.30	2.25	Elder (Sambucus canadensis) ..		.30
Red, eosine, blue shade .....	.25	2.25	Elm, slippery elm (Ulmus fulva) ..		.30
Red, fuchsin .....	.20	1.50	Lemon peel (Citrus limonum) ..		.20
Red, rose bengal .....	.75	6.50	Oak, black .....		.20
Red, rubin .....	.20	2.00	Oak, red .....		.20
Red, saffranine .....	.20	2.25	Oak, white .....		.20
Red, scarlet .....	.15	1.25	Orange peel .....		.20
Vesuvian .....	.15	1.25	Orange peel, cut .....		.20
Violet, gentian .....	.25		Orange peel, ground .....		.20
Violet, Haffman's .....	.25	2.00	Orange peel, powdered .....		.25
Violet, purpurin, benzo .....	.25		Orange peel, Curacao .....		.20
Violet, purpurin, delta .....	.25		Orange peel, ground .....		.20
Yellow, mandarin .....	.25		Pomegranate (bark of root of		
Yellow, metaniline .....	.25		Punica granatum) .....		.40
Yellow, naphthol .....	.20	1.50	Sassafras (Sassafras variifo-		
Yellow, primuline .....	.20	1.75	lum) .....		.25
<b>Animal charcoal:</b>			Spicewood (Lindera benzoin) ..		.25
In grain—10 lb., .07 .....		.10	Wild cherry (Prunus serotina) ..		.20
Powder .....		.10	Bauxite .....		.30
Purified .....	.10	.50	Bay leaves .....		.15
Annatto .....	.10	.40	Bay rum—Gal. \$2.75.		
Anthracene, subl. 90% .....	.15		<b>Beans:</b>		
<b>Antimony:</b>			Vanilla .....		4.00
Metallic .....		.35	Tonka .....		1.90
Liver of .....		.50	<b>Beeswax:</b>		
Butter of .....		.26	White .....		.60
Aqua Regia .....		.50	Yellow .....		.45
Argols .....		.16	Berlin Blue .....	.10	.40
<b>Arrowroot:</b>			<b>Berries:</b>		
Hermuda .....	.10	.75	Elder (Sambucus nigra) .....	\$0.25	
St. Vincent .....		.17	Huckle (Vaccinium myrtillus) ..		.40
Arsenic, metallic .....		.40	Juniper (Juniperus communis) ..		.15
<b>Asbestos:</b>			Poke (Phytolacca decandra) ..		.30
White, short fiber .....		.40	Raspberries (Rubus idaeus) ..		.60
Washed in nitric acid .....	.25	1.50	Sumach (Rhus glabra) .....		.15
Washed and ignited .....	.30	2.25	Winter cherry (Physalis Alke-		
Wool .....		.40	kengi) .....		.50
Asphaltum, true .....	.10	.30	Bismuth, metallic .....	.35	3.90
Babbitt metal .....		.35	Bitumen .....		.25
<b>Balsam:</b>			Black lead .....		.10
Canadian (fir), true .....	.10	.30	Blanching powder .....		.10
Copaiba .....	.15	.90			

See explanation on page 980



# Chemical Manipulations

(Technical Substances)			(Technical Substances)		
	Per oz.	Per lb.		Per oz.	Per lb.
<b>Bole:</b>			Cochineal .....	.10	.75
Armenian .....	.05	.20	Cocoa butter .....	..	.70
White .....	..	.15	Collodion .....	.10	.95
Bone ash—Finest quality, by			Collodion cotton .....	.35	3.25
5lb., .00 lbs. ....	..	.12	Colophony, yellow or white...	..	.10
Bone black, powdered .....	..	.10	Congo red .....	.20	1.75
Brazil wood .....	..	.15	Test paper, in sheets—Per		
Bromine .....	.25	..	doz., .50; each, .05.		
Solidified .....	.25	..	<b>Copper:</b>		
Brunswick black .....	.10	.70	Metallic, turnings .....	..	.60
Burgundy pitch .....	..	.20	Foil .....	..	.60
Butter cacao .....	.10	.70	Granulated .....	.10	.60
<b>Cadmium:</b>			Powder .....	.20	2.35
Metallic sticks .....	.12	1.55	Wire .....	.10	.86
Metallic shells .....	.25	3.85	<b>Coral:</b>		
Metallic granulated .....	.35	3.85	White, prepared .....	..	.30
Calcium carbide—2-lb. cans,			Red .....	..	.35
30. ....	.15	1.50	Corallin .....	..	1.25
Caoutchouc .....	.35	3.50	<b>Cotton:</b>		
For dissolving, pure .....	..	..	Absorbent .....	..	.30
Caramel—Gal., 75.			Non-absorbent .....	..	.35
<b>Carbon:</b>			Crab apple salt .....	..	.15
Ground, for pyrotechny .....	..	.06	Cresote, white .....	..	.75
Tetrachloride .....	..	.25	Crocus marts .....	.05	.20
Willow, meal—10-lb. lots.	.20	.25	Composition .....	..	.08
Animal, in grain .....	..	.10	Crysolite—Gal., \$1.	..	..
<b>Carborundum</b> .....	..	.40	Cudbear .....	..	.25
Casein .....	.10	.55	Cumarin .....	.35	..
C. P. ....	.25	3.50	Curare—Gram, \$1.25.		
<b>Cassius:</b>			Curcumin—Gram, .25.		
Purple, of 5% .....	..	3.50	Cuttle fish bone:		
Purple, of 15% .....	..	7.00	Powdered .....	..	.40
Catechu .....	.05	.15	Jewelers' .....	..	1.00
<b>Ceresine:</b>			<b>Dextrin:</b>		
White .....	..	.30	Canary yellow—10-lb. lots.		
Yellow .....	..	.25	.10 .....	..	.15
Black .....	..	.12	Domestic, white (imported,		
<b>Chalk:</b>			white, lb., .18) .....	..	.15
In lump—10-lb. lots .....	.04	.05	<b>Dextrose:</b>		
Precipitated—10-lb. lots .....	.10	.12	Glucose, lump .....	..	.10
Red—10-lb. lots .....	.12	.15	Glucose, crystals .....	..	.15
French, in tablet—10-lb.			Diamond inks .....	.45	4.00
lots .....	.20	.25	Diamond powder, \$1.50 per		
<b>Charcoal:</b>			carat, packed in quarter-		
From blood .....	.20	2.25	carat packages.		
From meat .....	.25	3.25	Dianthase .....	.75	..
From sponge .....	.10	.85	Distilled water—5 gals., .50.		
From wood .....	..	.10	Dolomite .....	..	.30
<b>Chrome gray, orange or yel-</b>			<b>Dragon's blood:</b>		
<b>low</b> .....	..	.12	In reed .....	.10	.80
Chromium powder, 95% .....	..	1.50	Powder .....	..	.85
Cinnabar, pure .....	.20	1.50	Dutch leaf—Book, .10.		
<b>Clay:</b>			Elaterium, ¼ oz., .25.		
Fire .....	..	.05	Emery flour .....	..	.10
Potters'—Cake, .05 .....	..	.05	Medium .....	..	.10
<b>Cobalt:</b>			Coarse .....	..	.10
Blue .....	..	.25	<b>Ether:</b>		
Ultramarine .....	..	.20	Acetic, rectified .....	.10	.60
Foil .....	1.35	..	Amylic .....	1.00	..
Metallic .....	.50	..			

See explanation on page 980

# Chemical Manipulations

(Technical Substances)			(Technical Substances)		
	Per oz.	Per lb.		Oz.	
Ether ( <i>continued</i> )			Vanadium, 10%.....	\$0.40	
Butyric, domestic.....	.15	1.25	Vanadium, 25%.....	.60	
Butyric, chem. p., absolute.....	.35	4.40		Per Per	
Citric.....	1.70	..		oz. lb.	
Formic, concentrated, domestic.....	.22	1.80	Fire Clay.....	..	\$0.05
Nitric (ethyl nitrate).....	.95	..	Fish glue, liquid—Gal., \$1.50.....		
Oenanthic (oil of cognac), rectified, white.....	3.75	..	Fruit sugar.....	.35	3.60
Oenanthic (oil of cognac), nat. green.....	3.25	..	Fluorescein.....	.75	..
Oenanthic (oil of cognac), artificial, chemically pure.....	.65	7.50	Fluorspar.....	..	.09
Sebacic.....	.75	..	Flux:		
Succinic.....	.60	7.15	Black, Plattner's.....	.15	1.40
Valerianic.....	.40	5.00	Black, substitute.....	..	.20
Fehling's solution.....	.10	1.00	Bismuth.....	.25	2.40
Feldspar.....	..	.10	Boric acid.....	.15	1.25
Fibrin, from blood.....	.60	..	Lead No. 1—5 parts potassium carbonate, 6½ parts sodium bicarbonate, 2½ parts flour, 2½ parts ground borax glass, .25 per lb.; 100 lb. or more, .20.		
Essences:			Lead No. 2—6½ parts potassium carbonate, 5 parts sodium bicarbonate, 1 part flour, 2½ parts ground borax glass, .25 per lb.; 100 lb. or more, .20.		
Allspice.....		Pint. \$0.75	Lead No. 3—8 parts potassium carbonate, 2 parts sodium bicarbonate, 1 part flour, 1 part ground borax glass, .25 per lb.; 100 lb. or more, .20.		
Almond, artif.....		.75	Lead No. 4—2 parts potassium carbonate, 2 parts sodium bicarbonate, 1 part flour, 1 part powdered borax, .20 per lb.; 100 lb. or more, .15.		
Anise.....		1.00	Fuller's earth, powdered.....	..	.10
Bergamot.....		1.00	Fusible metal:		
Cinnamon.....		.75	Rose's, melts about 201° F.....	.30	3.50
Clove.....		.75	Woods', melts about 141° F.....	.30	3.50
Cognac, artif.....		3.00	Galena.....	..	.15
Gin.....		1.50	Gall nuts.....	.05	.50
Ginger.....		.70	Gamboge.....	.15	1.25
Jasmine.....		2.75	Gelatin:		
Lemon.....		.75	In sheets, white, No. 1, finest.....	.10	.65
Orange.....		.75	Cooper's.....	.10	.75
Orrisroot.....		1.00	Red.....	..	1.00
Peach.....		1.00	For photographic emulsions.....	..	1.25
Pear.....		.75	In sheets, 18 x 18 in., colored, red, blue, green, yellow, orange and purple, per sheet, .25.		
Peppermint.....		1.25	Glass, powdered.....	..	.20
Rose.....		1.50	Glass wool:		
Rum flavor.....		2.25	Coarse.....	.50	6.00
Sarsaparilla.....		.75	Fine.....	.65	8.00
Sassafras.....		.75			
Spearmint.....		.90			
Waldmeister.....		1.25			
Whiskey:					
Bourbon.....		3.00			
Rye.....		3.00			
Wintergreen.....		1.00			
Lb.					
Ferro-Bor.....		\$7.00			
Chromc, 70%.....		.30			
Copper.....		1.29			
Manganese, 85%.....		.30			
Molybdenum.....		3.20			
Nickel, 30%.....		1.40			
Nickel, 50%.....		1.50			
Silicon, 30%.....		.25			
Silicon, 75%.....		.50			
Titan.....		1.50			
Tungsten, 67.9%.....		.75			

See explanation on page 980

[ 983 ]

# *Chemical Manipulations*

(Technical Substances)			(Technical Substances)		
	Per oz.	Per lb.		Per oz.	Per lb.
Glucose (grape sugar) :			Solution, in chloroform....	.35	
White, solid.....	..	.10	Gypsum, lump.....		.10
Crystallized, pure.....	..	.15	Hide powder.....	.40	4.00
Syrup.....	..	.10	Honey.....	..	.20
Glue :			Clarified.....	..	.30
Red, best.....	..	.25	Of roses.....	..	.50
Ground.....	..	.20	Hops.....	.05	.45
White, No. 1.....	..	.40	Iceland spar, crystals.....	.20	2.00
Buffalo.....	..	.40	Indigo :		
Liquid.....	..	.50	Bengal.....	.10	1.25
Cologne.....	..	.18	Madras.....	.10	.65
Fish liquid—Gal., \$1.50.			Indol (indulin), ¼ oz., 25.....	1.35	..
Marine, hard.....	.20	2.50	Infusorial earth.....		.10-.15
Marine, liquid.....	.20	1.75	Insect powder.....		.25-.35
Marine, liquid (colorless)..<	.30	1.90	Invert sugar—Gram., 75.....		
Gluten, pure—¼ oz., 40.....			Iodine.....	.30	2.90
Goat's blood.....	..	.35	Iron :		
Gold, metallic—Gram, \$2.....			Filings.....	..	.10
Gold leaf—Book, about .40; varies.....			Powder.....	..	.35
Graphite :			Wire, pure.....	.10	.50
In lumps.....	..	.10	Pyrites.....	..	.10
Powdered.....	..	.20	Isinglass :		
Lubricating.....	..	.25	American.....	.15	1.20
Lubricating, prepared for electrotyping.....	.10	.50	Russian.....	.40	4.75
Gum :			Shredded.....	.20	1.00
Ammoniac.....	.10	.60	Kaolin :		
Arabic, No. 1.....	.10	.65	White—By 10 lb., .05.....	..	.10
Benzoin.....	.10	.60	Washed.....	..	.20
Copal.....	.05	.45	Kefir fungi.....	.95	..
Damar.....	..	.35	Kieselguhr.....		.10-.15
Elemi.....	.10	.50	Kryolite, selected, white.....	..	.25
Euphorbium.....	.10	.40	Lacquer—Gal., \$4 to \$5.....		
Galbanum.....	..	.60	Lactose powder.....	..	.22
Gamboge.....	.15	1.25	Lampblack—¼ lb., .05; ½ lb., .10.....		.12-.15
Guaiac.....	..	.30	Lead :		
Kauri.....	.10	.60	Bars.....	..	.13
Kino.....	.10	.55	Foil.....	..	.20
Mastic.....	.10	.75	Granulated.....	.10	.24
Myrrh.....	.10	.50	Shot.....	..	.15
Olibanum.....	.10	.35	Levulose.....	2.25	..
Sandarac.....	.05	.35	Lime :		
Senegal.....	.10	.35	Marble.....	..	.10
Seed lac.....	.10	.80	Burnt.....	..	.10
Shellac, orange.....	..	.75	Slaked or unslaked.....	..	.10
Shellac, powdered.....	..	.80	Vienna.....	..	.25
Shellac, bleached.....	..	.85	Chlorinated.....	..	.10
Spruce.....	..	.25	Water—Gal., 35.....		
Thus (turpentine).....	..	.12	Litmus, best, in cubes.....	.10	.30
Tragacanth, No. 1.....	..	1.00	Loadstone.....	..	.75
Tragacanth, second grade.....	..	.80	Logwood.....	..	.10
Guncotton, soluble.....	.25	2.50	Extract of.....	..	.25
Gutta percha :			London purple.....	..	.25
In chips for dissolving.....	.20	1.75	Luminous paint.....	.35	3.60
Tissue—Yard, 55.....			Magnesium.....	..	1.50
Thin sheets for dissolving, brown.....	.25	2.00	Magnesium :		
			Metallic.....	.35	3.50
			Ribbon or wire.....	.55	6.50
			Maltose, pure, cryst.....	.60	5.50

*See explanation on page 980*

# Chemical Manipulations

(Technical Substances)			(Technical Substances)		
	Per oz.	Per lb.		Per oz.	Per lb.
Manganese, 92% .....	.20	..	Oil (continued)	6.00	..
Marble, dust, chips or lumps ..	..	.10	Cognac .....	..	..
Mercury .....	..	.85	Cottonseed—Gal., .75.	..	..
Redistilled .....	..	.94	Fish—Gal., .50.	..	..
Mica:			Fusel—Qt., .50; pt., .30.	..	..
Powdered .....	..	.20	Lard .....	..	.20
Sheets, as per size .....	..	.50 up	Lavender .....	.20	1.75
Microcosmic salt, C. P. ....	.10	.50	Lemon .....	..	1.50
Mineral wool .....	..	.15-.20	Linseed, raw .....	..	.15
Monazite .....	..	.40	Linseed, boiled .....	..	.15
Mosaic gold (bisulphide of tin) ..	.25	..	Myrrhane .....	..	.20
Moss:			Neatsfoot—Gal., \$1.	..	..
Irish .....	.05	.20	Neroli (orange flowers), bigarade, ¼ oz., .75.	..	..
Island .....	.05	.20	Olive .....	..	.40
Musk:			Orange, finest .....	.30	..
Genuine—Grain, .10.	..	..	Orris, ¼ oz., .75.	..	..
Artificial .....	.60	..	Palm .....	..	.25
Naphthalene:			Paraffine—Gal., .40.	..	.10
Tapers .....	..	.15	Peach kern ls. ....	..	.40
Balls .....	..	.15	Peanut .....	..	.40
Nessler's test solution .....	.15	1.10	Pear (amyl-acetate), pt., .75.	..	..
Nickel:			Peppermint .....	.40	5.00
Metallic, 90% .....	.10	1.00	Petroleum, crude—Gal., .35.	..	..
Foil .....	.20	1.95	Rose (Kewanee), ¼ oz., \$1.25.	..	..
Wire .....	.20	2.00	Rosin—Gal., .45.	..	.10
Anodes (of cast nickel) ....	..	1.20	Sandalwood .....	.50	5.00
Anodes (of cast nickel), 10 lb. or more .....	..	1.10	Sassafras .....	.10	.75
Anodes (of cast nickel), 50 lb. or more .....	..	1.00	Sesame—Gal., \$1.75.	..	..
Anodes (of cast nickel), 100 lb. or more .....	..	.90	Sperm .....	..	.20
1¾ x 4 x 3-16 inches, ½ lb.; 3 x 8 x 5-16 inches, 2¼ lb.; 4 x 8 x ½ inches, 4½ lb.; 8 x 16 x ½ inches, 18 lb. (Weights are approximate.) Add 10 cts. per lb. for these small sizes. Larger sizes furnished to order.	..	..	Tar .....	..	.15
Nutgalls (powdered, lb. .50) ..	.05	.40	Tobacco .....	1.40	..
Nuts, kola .....	.10	.40	Turkey red .....	.10	.50
Oakum .....	..	.13	Turpentine (rectified) ..	.25	..
Ocher .....	..	.05	Wax .....	.25	..
Oil:			Whale .....	..	.20
Almond .....	.60	6.50	Wintergreen .....	.20	1.90
Artificial .....	..	1.00	Ylang-Ylang .....	6.20	..
Amber, crude .....	.10	.50	Orpiment .....	..	.25
Amber, rectified .....	.05	.35	Oxgall .....	.25	..
Anise .....	.20	2.00	Oyster shells .....	..	.15
Asphaltum .....	..	4.25	Ozokerite .....	..	.30
Bay .....	.04	4.70	Paper:		
Bergamot .....	.40	..	Emery—Quire, .35.	..	..
Cedar .....	.10	1.10	Paraffine—Quire, .25.	..	..
Cloves .....	.20	1.75	Parchment—Quire, .35.	..	..
Coconut .....	.25	..	Sand—Quire, .25.	..	..
			Wax—Quire, .35.	..	..
			Litmus, blue, in sheets, each .05; doz., .50.	..	..
			Turmeric, in sheets, each .05; doz., .50.	..	..
			Paraffine:		
			Pure white, hard, melting point, 130° F. or 55° C. ..	..	.15
			Liquid .....	..	.20
			Paris green, pure .....	..	.40
			Paris white .....	..	.05
			Pearlash .....	..	.10

See explanation on page 980

# Chemical Manipulations

(Technical Substances)			(Technical Substances)		
	Per oz.	Per lb.		Per oz.	Per lb.
Petrolatum:			Salt:		
Yellow .....	..	.15	Sea .....	..	.10
White .....	..	.25	Sorrel .....	..	.25
Phosphorus, yellow sticks....	.24	1.25	Schlippe's .....	.25	..
Pipe clay.....	..	.10	Scheele's green.....	.10	.75
Pitch:			Sealing wax:		
Black .....	..	.10	Fine red, in sticks.....	..	.75
Burgundy .....	..	.20	Common, bottle wax.....	..	.10
Plaster of paris.....	..	.10	Selenium, sticks.....	1.80	22.00
Platinum foil wire, etc.—			Sienna, raw or burnt.....	..	.08
Gram, \$1.27-\$1.50; fluctu-			Silex .....	..	.04
uates.			Silica:		
Plumbago: *			In fine powder.....	..	.10-.12
In lumps.....	..	.20	Precipitated, pure.....	.10	.75
Powdered .....	..	.20	Silver:		
Fine powder for electrotyp-			Granulated .....	1.25	..
ing .....	.10	.50	Foil .....	1.25	..
Potassium, metallic.....	1.70	22.50	Leaf—Book, .20		
Potter's clay—Cake, .05.			Anodes .....	1.20	..
Powdered .....	..	.05	Soapstone, powder.....	..	.04
Primuline .....	.20	1.75	Sodium, metallic.....	.15	1.20
Prussian blue.....	.10	.55	Soot .....	..	.20
Soluble in water.....	.10	.60	Spar, heavy (barite).....	..	.10
Pumice stone—10 lb., .08....	..	.10	Spermaceti .....	..	.45
Powdered, fine, 10 lb., .07..	..	.10	Stains—\$1 gal. up.		
Purple of Cassius, C. P., ¼			Starch:		
oz., \$1.75.			Corn .....	..	.10-.15
Putty powder .....	.25	2.90	Iodized .....	.25	..
Pyroxilin .....	.25	2.50	Potato .....	..	.10-.15
Quartz, powdered.....	..	.10	Wheat .....	..	.15
Realgar .....	..	.25	Stearine .....	..	.35
Red lead.....	..	.10	Steel filings.....	..	.15
Rennet .....	..	..	Sugar:		
Resin, white or yellow.....	..	.10	Cane, C. P.....	..	1.00
Resorcin, cryst., white, pure..	.15	..	Grape .....	..	.10
Retinol .....	.70	..	Sugar milk:		
Rhodium—5-grain vial, \$2.50.			Crystallized .....	..	.35
Rice flour.....	..	.25	Powdered .....	..	.35
Rock salt .....	..	.10	Sulphur:		
Resin:			Roll—By 25 lb., lb. .05....	..	.08
By 5 lb., at .05.....	..	.06	Sublimed (flowers), by 25		
Powdered .....	..	.18	25 lb., lb. .07.		
White—By 5 lb., at .08....	..	.15	Precipitated .....	..	.20
Rotten stone.....	..	.10	Washed .....	..	.15
Powdered .....	..	.15	Sumac .....	..	.15
Rouge:			Talc .....	..	.15
Jeweler's, best French.....	.13	1.20	Powdered, in quantity.....	.04	.10
Soft gold.....	.10	.95	Tallow .....	..	.25
Soft gold, 50 lb. or more..	..	.90	Tar:		
Hard nickel.....	.10	.27	Barbadoes—Gal., .60.		
Hard nickel, 50 lb. or more.	..	.25	Strained—Pint can, .25;		
Soft nickel.....	.10	.55	2-gal. can, \$1.		
Soft nickel, 50 lb. or more.	..	.50	Terebene, pure.....	.10	.65
Soft silver.....	.10	.95	Terra alba.....	..	.10
Soft silver, 50 lb. or more..	..	.90	Test paper, litmus paper, blue		
Hard silver.....	.10	.90	and red, turmeric, Brazil-		
Hard silver, 50 lb. or more	..	.85	wood, Congo, lead acetate,		
Rush, scouring .....	..	.25	per sheet, .05; per doz.,		

See explanation on page 980

# Chemical Manipulations

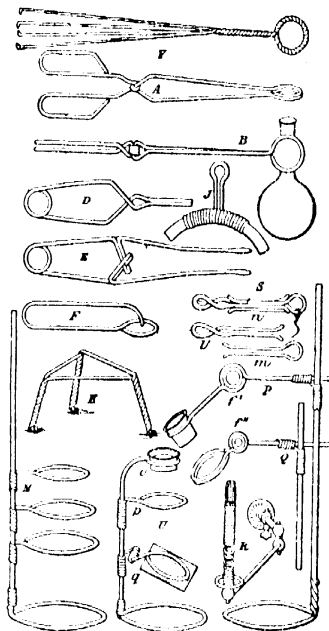
(Technical Substances)			(Laboratory Apparatus)		
	Per oz.	Per lb.		Per oz.	Per lb.
Test paper, etc. ( <i>continued</i> )			Wax:		
.50; per book, .05; per box (10 books), .25; nar- row books (24 in box), per box, .30.			Beeswax, yellow, technical (by 5 lbs., .45) :.....	.05	.50
Thermit:			Beeswax, pure (by 5 lb., .60) .....	.10	.65
Black .....	..	.90	Beeswax, white (by 5 lb., .60) .....	.10	.60
Red .....	..	.75	Carnauba (Brazil) (by 5lb., .50) .....	.10	.55
Thymol, cryst., pure, white..	.30	3.25	Japan .....	..	.30
Tin:			Myrtle .....	..	.50
Bars .....	.10	.55	Ozokerite .....	..	.18
Granulated .....	.10	.75	Paraffine .....	..	.15
Foil, thin .....	..	.37	Sealing wax, bottle wax... ..	..	.10
Foil, heavy .....	..	.31	Sealing wax, fine, sticks... ..	..	.75
Foil, pure .....	..	.70	Water, distilled (by 5 gals., .50) ; gal., .10.		
Amalgam .....	.45	5.60	Water:		
And zinc amalgam .....	.30	4.00	Almonds, bitter .....	\$1.00	
Tripoli powder .....	.10	..	Caraway .....	.25	
Tungsten:			Cherry laurel .....	.30	
Metallic, pure—Gram, .20.			Cinnamon .....	.20	
For steel manufacture.....	.15	1.10	Cologne .....	1.00	
Turmeric:			Dill .....	.20	
Powdered .....	..	.20	Elderflower .....	.50	
Paper— <i>see Test paper</i> .			Javelle—Gal., .50.....	.10	
Turpentine:			Lavender .....	.40	
Spirits—Gal., .80; pt., 15.			Lime—Gal., .50.....	.10	
Spirits, refined—Gal., \$2; pt., .40.			Orange flower—Gal., \$1.50....	.25	
White, hard, select.....	..	.15	Peppermint .....	.25	
Venice .....	..	.25-.40	Raspberry .....	.30	
Ultramarine, artificial.....	..	.25	Tar .....	.20	
Vanillin .....	.60	..	Wintergreen .....	.25	
Varnish:				Per oz.	Per lb.
Amber—Gal., \$8.			White acid in ceresine bottle..	..	.70
Asphaltum—Pt., .20; gal., \$1.25.			White lead .....	..	.10
Black, for iron—Pt., .20.			Whiting (by 25 lb., lb. .02½).	..	.05
Bronzing liquid—Gal., \$1.35.			Wool:		
Copal, best—Pt., .50.			Glass .....	.75	..
Dammar—Pt., .35; gal., \$1.75.			Mineral .....	..	.15
Flowing—Gal., \$2.50.			Steel—Fine, lb., .80.....	..	.65
Gold size—Gal., \$4.			Zaffre .....	.10	.75
Negative, photographers', 8-oz. bottle, .50.			Zinc:		
Picture—Gal., \$1.25.			Slaps .....	..	.15
Spar—Gal., \$4.			Sts etc .....	..	.20
White enamel—Gal., \$2.75.			Granulated .....	..	.22
Verdigris:			Powdered .....	..	.25
Powdered .....	.05	.50	Amalgam .....	..	.60
Recryst., pure .....	.10	.70			
Vermillion:			LABORATORY APPARATUS		
Chinese .....	.15	..	Wire Apparatus for Laboratory Use.		
English .....	.12	1.50	For most of the apparatus shown, some		
Vesuvius .....	.15	1.25	oxidizable wire should be selected, such		
Vienna lime, lump' or pow- dered .....	..	.20	as brass or tinned iron, and the tools for		
			forming these articles of wire consist of		
			a pair of cutting pliers, a pair of flat and		
			a pair of round-nosed pliers, a few cy-		

See explanation on page 980

## Chemical Manipulations

### (Laboratory Apparatus)

lindrical mandrels of wood or metal, made in different sizes, and a small bench vice. Any or all of the articles may be in different sizes, and of different sizes of wire for different purposes.



Wire Apparatus for Laboratory Use

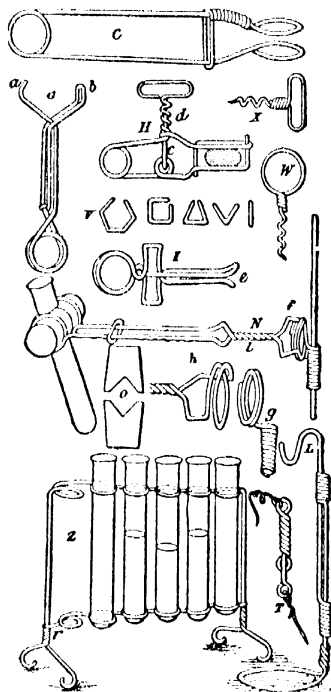
A shows a pair of hinged tongs, which are useful for handling coals about the furnace, for holding a coal or piece of pumice for blowpipe work, and for holding large test tubes and flasks, when provided with 2 notched corks, as shown in B and O. These tongs are made by first winding the wire of one half around the the wire of the other half to form the joint, then bending each part at right angles, forming on one end of each a handle, and upon the other end a ring. By changing the form of the ring end the tongs are adapted to handling crucibles and cupels and other things in a muffle.

C shows a pair of spring tongs, the con-

### (Laboratory Apparatus)

struction of which will be fully understood without explanation. It may be said, however, that the circular spring at the handle end is formed by wrapping the wire around any round object held in the vice; the rings at the opposite end are formed in the same way. The best way to form good curves in the wires is to bend them around some suitable mandrel or form.

D shows a spring clamp for holding work to be soldered or cemented. It may also be used as a pinch cock.



Wire Apparatus for Laboratory Use.

E represents a pair of tweezers, which should be made of good spring wire flattened at the ends. F is the clamp for mounting microscope slides, and for holding small objects to be cemented or sol-

## Chemical Manipulations

### (Laboratory Apparatus)

dered. *G* is a pinch cock for rubber tubing; its normal position is closed, as in the engraving, but the end *a* is capable of engaging the loop *b*, so as to hold the pinch cock open. *H* shows a clamp or pinch cock having a wire *c* hooked into an eye in one side, and extending through an eye in the other. This wire is bent at right angles at its outer end to engage a spiral *d*, placed on it and acting as a screw. The open spiral is readily formed by wrapping 2 wires parallel to each other on the same mandrel, and then unscrewing one from the other. The handle will of course be formed by aid of pliers. *I* shows still another form of pinch cock. It is provided with 2 thumb pieces, which are pressed when it is desired to open the jaws. *K* is a tripod stand, formed by twisting 3 wires together. This stand is used for supporting various articles, such as a sand bath or evaporating dish, over a gas flame. It is also useful in supporting charcoal in blowpipe work.

*L* shows a stand adjustable as to height for supporting the beak of a retort, or for holding glass conducting or condensing tubes in an inclined position. The retort or filter stand, represented in *M*, is shown clearly enough to require no explanation. Should the friction of the spiral on the standard ever become so slight as to permit the rings to slip down, the spirals may be bent laterally, so as to spring tightly against the standard. *N* shows an adjustable test tube holder, adapted to the standard shown in *M*, and capable of being turned on a peculiar joint, so as to place the tube in any desired angle. The holder consists of a pair of spring tongs, having eyes for receiving the notched cork, as shown in *O*. One arm of the tongs is corrugated to retain the clamping ring in any position along the length of the tongs. The construction of the joint by which the tongs are supported from the slide on the standard is clearly shown in *O a*. It consists of 2 spirals *g* *h*, the spiral *h* being made larger than the spiral *g*, and screwed over it, as shown in *O*. This holder is very light, strong and convenient.

*P* represents a holder for a magnifier, which has a point *f*, similar to the one just described. The slide *k* is formed of a spiral bent at right angles and off set to admit of the two straight wires passing each other. This holder may be used to advantage by engravers and draughtsmen. *Q* shows a holder for a microscope condenser, the difference between this and *P* being that the ring is made double to receive an unmounted lens.

### (Laboratory Apparatus)

*R* shows a Bunsen burner, formed of a common burner, having a surrounding tube made of wire wound in a spiral, and drawn apart near the top of the burner to admit the air, which mingles with the gas before it is consumed at the upper end of the spiral.

*S* represents a connector for electrical wires, which explains itself. The part with a double loop may be attached to a fixed object by means of a screw. Another electrical connector is shown in *T*, one part of which consists of a spiral having an eye formed at each end for receiving the screws which fasten it to its support, the other part is simply a straight wire having an eye at one end. The connection is made by inserting the straight end in the spiral. To increase the friction of the two parts, either of them may be curved more or less.

A microscope stand is shown in *U*. The magnifier is supported in the ring *a*. The ring *p* supports the slide, and the double ring *q* receives a piece of looking-glass or polished metal, which serves as a reflector.

*V* shows a set of aluminum grain weights in common use. The straight wire is a 1 gr. weight, the one with a single bend is a 2 gr. weight, the one having two bends and forming a triangle is a 3 gr. weight, and so on. *W* and *X* are articles now literally turned out by the million. It is a great convenience to have one of these expensive little corkscrews in every cork that is drawn occasionally, thus saving the trouble of frequently inserting and removing the corkscrew. The cork puller shown in *Y* is old and well known, but none the less useful for removing corks that have been pushed into the bottle, and for holding a cloth or sponge for cleaning tubes, flasks, etc.

*Z* shows a stand for test tubes. The wire is then formed into a series of loops, and twisted together at *r* to form legs. A very useful support for flexible tubes is shown in *J*. It consists of a wire formed into a loop, and having its ends bent in opposite directions to form spirals. A rubber tube supported by this device cannot bend so short as to injure it. Most of the articles described above may be made to the best advantage from tinned wire, as it possesses sufficient stiffness to spring well, and at the same time is not so stiff as to prevent it from being bent into almost any desired form. Besides this the tin coating protects the wire from corrosion, and gives it a good appearance.

—George M. Hopkins.

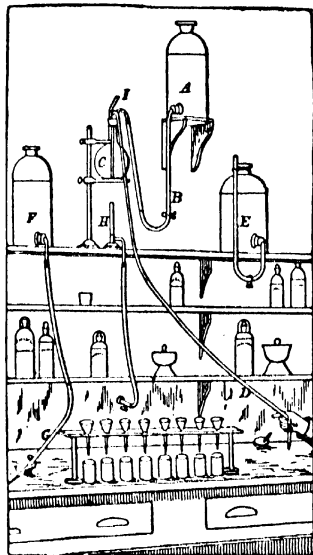


## Chemical Manipulations

### (Laboratory Apparatus)

#### Wash Bottle.

By this simple device the washing of precipitates and the cleansing of vessels used in the process of analysis, which before required the use of the ordinary wash bottle, can now be done with much more facility and in a shorter time. It consists essentially of a thin glass flask *C*, placed about 3 ft. above the level of the working desk, and closed by a 3-hole rubber stopper. Through one of the holes issues a rubber tube *D* (or glass with rubber connections), descending to the desk and ending in a glass nozzle. Connection is made by a second hole in the stopper with a reser-



Laboratory Table Showing Wash Bottles.

voir bottle *A*, placed above the top of the wash bottle. In the third hole is placed a glass tube bent at an angle to keep out dust. On filling the flask from the reservoir by a pinch cock placed conveniently to the hand, the height of the water flask voir—the flow being stopped by a pinch cock—the water is started by suction from below, and the stream through the

### (Laboratory Apparatus)

nozzle can be regulated or stopped at will furnishing the pressure, which is sustained by the syphon.

A Bunsen burner *H* is placed underneath the flask, and the water can be heated when it is so desired. Hot water as well as cold can thus be used in treating precipitates. Other solutions can be employed equally as well as water. (See bottle *F*).

The advantages of the system are:

1. The saving of much time and consequent labor attending the use of an ordinary wash bottle, especially where several analyses are carried on at the same time, the exertions required by the mouth and lungs being thereby avoided.

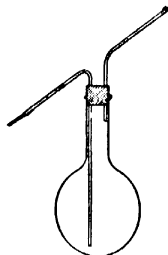
2. No air exists in the tube, as in an ordinary wash bottle, and consequently the full force of the liquid is utilized immediately.

3. When used with a wash solution of ammonia water, no trouble is experienced with free ammonia, which ordinarily is quite hurtful to the mouth and eyes.

The large bottle *E* with the accompanying tube shows a convenient arrangement for holding any solution and delivering the same.

The shelves of a laboratory should be widest at the bottom and should become of less depth at the top to accommodate smaller bottles. The large acid bottles should be put on the bottom shelves. Reagent bottles with the names and symbols blown in are very convenient.

A wash bottle is easily constructed with the aid of a couple of glass tubes and a flask or any bottle of convenient size. One of the glass tubes should be drawn out to the fine point, and the other should be inclined so that it is easily introduced into the mouth. Any desired quantity of water may be forced through the fine powder by moderate blowing. In some



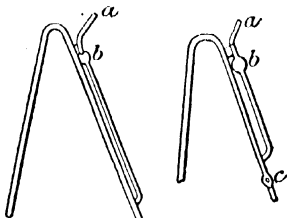
Wash Bottle.

## Chemical Manipulations

### (Syphons)

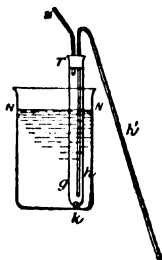
cases the wash bottle is more efficacious when warm. For fine chemical work still water should preferably be used.

**Syphons.**—Our engravings show handy glass syphons adapted for small operation, the former being without, the latter with stop cock *c* for regulating the flow.



Glass Syphons.

The current is started in these by applying the mouth to the end *a* of the tube, and employing it as an air pump to exhaust the air till the fluid rises into the bulb *b*. With harmless liquids, a simple



Improved Syphon.

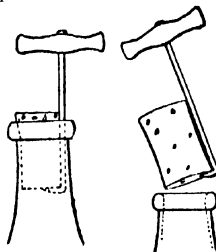
bent glass tube may suffice as a syphon; but suction with the mouth at the end of the longer arm is somewhat inconvenient. The arrangement shown above is simple, and presents certain advantages: A glass tube *g*,  $\frac{3}{4}$  in. wide, and 12-16 in. long, contracted at the lower end, has, at its upper end, a cork stopper, in which the mouthpiece *M* and the syphon *h h'* are fixed air-tight. The shorter arm *h* of the syphon reaches nearly to the bottom of the tube, and limits the play of a glass ball *k*, which acts as a valve. The diameter of the ball is about  $\frac{1}{2}$  in., that of the syphon  $\frac{1}{4}$  in. The instrument thus arranged, being dipped into the vessel to be discharged, the tubes *g* and *h* become

### (Cork Work)

filled with liquid to the surface *N N*. Instead of now sucking, as with the common syphon, one blows into the mouth-piece *M*; and in consequence of the compression of air, the lower opening is shut, by the ball *k*, while the liquid rises in *h*, and begins to flow through *h'* in the usual way. If the vessel to be emptied is not full, or the column of liquid is a small one, it is necessary before blowing into the mouthpiece, to suck it slightly, in order to obtain a larger volume of the liquid in *g*; as one condition for the right action of the instrument is that *h h'* should be filled before the column of liquid in *g* sinks to the mouth of the syphon at *k*, when one blows through *M*.

### Cork Work.

Corks are of the greatest possible use in all laboratories. Boxes of corks may be had of all drug companies and a plentiful supply should be kept at all times. It would probably be necessary to buy larger corks separately. It is frequently necessary to perforate corks, and for this purpose a set of cork borers should be bought; they come in sets. An iron rod passes through the small holes, forming a handle. A rotary motion should be given to the hand at the same time pressure is applied. There is considerable knack in boring corks, but it is soon attained. After the glass tubes have been passed through the corks the corks can be swelled to insure a firm joint. Files and rasps are convenient for altering the



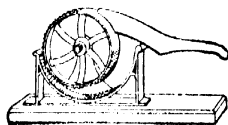
Cork Puller.

shape of corks. Rubber corks are very expensive, but are better for many purposes. They may be purchased already perforated. The ordinary cork borer may, however, be used, wet with dilute ammonia. Pieces of rubber tube of various sizes, and also pieces of hog's bladder for joints, and heavy linen thread for tying the same, should always be at hand.

## Chemical Manipulations

### (Stands)

A cork press will save its cost in a short time. The form shown in our en-

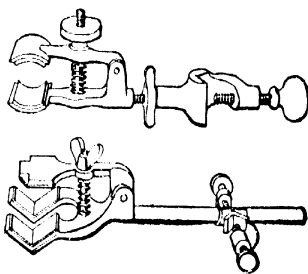


Cork Press.

graving is very effective. Corks which have been compressed give better results than those which are used dried. In the type of press shown, the cork is revolved at the same time it is being compressed, thus giving a uniform compression. Corks having a taper should be selected.

### Stands, Clamps, etc.

The amateur who has a shop at his disposal will have little difficulty in constructing all necessary supports, which

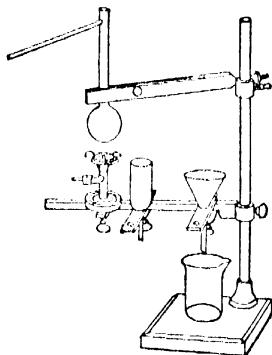


Clamps for Various Purposes.

will tend to materially assist his labors. To those who have no natural mechanical ability, or who have no facilities, are recommended to purchase such apparatus ready prepared of dealers in chemical supplies. A good retort stand is of prime importance, and one of our engravings shows how a retort stand may be used for several purposes at once. Iron retort stands are better than the wooden ones, and there should be at least 4 or 5 rings. The base should be of sufficient weight to make the stands firm at all times. If the base of the retort stand is too light it can be filled with lead. Our engravings also show a variety of clamps which are very useful for a great number of purposes; at least 2 or 3 such clamps should be provided. Nearly every

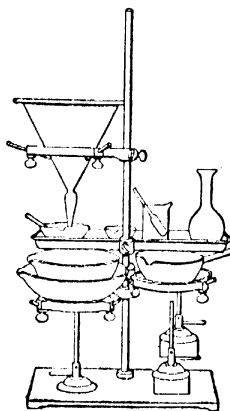
### (Stands)

dealer in chemical apparatus lists 15 or 20 different types at all prices. Where rubber tubes are used, pinch cocks will



Simple Retort Stand.

be found of value in cutting off the supply of the gas. They can be readily

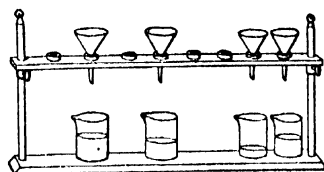


Many operations can be carried on at once with a good retort stand.

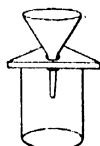
made by the amateur according to the designs given under WIRE APPARATUS in this section.

## Chemical Manipulations

### (Measuring Liquids)



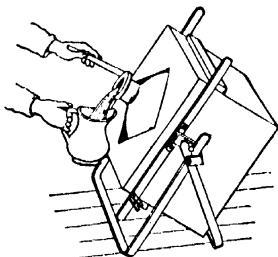
Simple Filter Holder.



A Triangular Holder.

### Measuring Liquids.

Liquids may be measured in dishes or containers, of which there are a large number of patterns. The writer recommends the Swedish white enameled ware



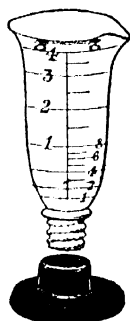
Carboy Tilting Stand.

as indicating at once if there is any dirt in the article. Almost any large dealer in household furnishings would be able to supply a large number of vessels for measuring liquids required by technologists and chemists. Copper measures last a long time, but are very hard to keep clean. They are good for alcoholic liquids. A porcelain measure with graduations inside is very useful. An article of this kind will save its cost in a short

### (Measuring Liquids)

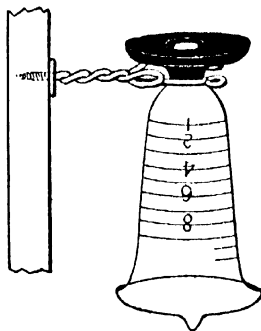
time for much work that is done in a laboratory.

Glass graduates form an essential part of the equipment of all laboratories, no matter how small or for what purpose.



Graduate with Rubber Foot.

Glass graduates of 2, 4, 8, 16, and 32 oz. are recommended. The chemical graduates are easier to get clean than the cylindrical ones. Glass graduates having a beaker shape lessen the liability of



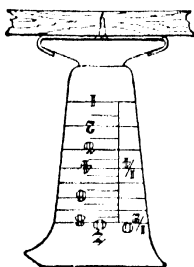
Graduate Suspended from Wire Hook.

breakage and are especially good for 16 and 32-oz. sizes. Some graduates have a double scale, both apothecary's and metric; these are specially recommended where mixed formulas are used calling for

## Chemical Manipulations

### (Scales)

both systems. Their use will save much time and calculations, and are specially useful in photographic work where many of the formulas are now given exclusive-



Graduate Slung under Shelf.

ly in metric system. A graduate is "no stronger than its foot," and this is the most vulnerable part of the glass measures. Rubber feet with the screw socket into which the top of the graduate screws have come into quite general use, and are recommended as they tend to decrease the breakage to a considerable extent. When graduates are not in use they should be hung up by the foot, as illustrated in one of our engravings.

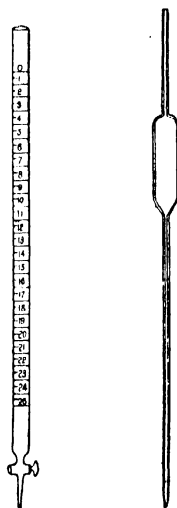
For beginning with small quantities of liquids the pipette is recommended, and the simplest form is like the well-known fountain pen filler. Small pipettes can be obtained shaped like a fork so that they can be used as such in small bottles. For volumetric work and for other accurate determinations, graduated pipettes are sold, but they are comparatively high in price. Small drops of liquid can be readily drawn out of a bottle and distributed with the aid of the pipette. The drop, however, is different from almost every substance, and the number of drops a minim varies from 60 to 250. An excellent table showing the number of drops in a fluid dram of different weights with the weights in grains and grams will be found in Remington's *Practice of Pharmacy*.

#### Scales.

A good ordinary scale costing from \$6 to \$10 is recommended. Scales should have a capacity of at least 10 lb. Any sensitive weighing such as required in analytical work, assaying, etc., should not be attempted with scales of this kind. Where

### (The Balance)

corrosive substances which would corrode metal scale pans are in use, the glass tanks should be used, or the substance should be weighed in glass bottles or other containers.



Pipettes.

*The Balance* is simply a pair of scales, made and adjusted so carefully as to show very small differences in weight of two substances.

The beam is supported in the middle by a wedge of hard steel, or of agate—a "knife-edge"—resting in a very shallow groove, also of steel. A similar arrangement is used for supporting the scale pans, but in this case the knife-edge is on the end of the beam. The steel should be protected by a very thin coating of vaseline.

By turning the screw placed outside the balance case, the beam may be raised so as to allow it to swing, or lowered so as to prevent any motion. When not in use it should always be lowered.

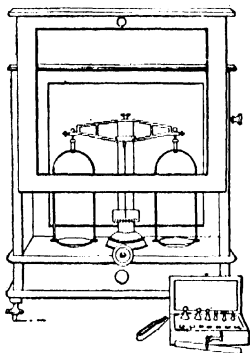
A pointer is fixed to the middle of the beam, and when the beam is swinging, the end of this pointed moves over a white graduated scale. When the two pans balance, the pointer will move over the

## Chemical Manipulations

(The Balance)

same number of divisions on each side of the zero position.

The weights to be used range from 50



A Balance of Precision.

grams to 1 milligram. The weights below 1 gram may be made of aluminum wire. Each weight should have a separate place in the box. The weights are arranged as follows:

grams.	grams.	grams.	grams.	grams.
50	5	0.5	0.05	0.005
20	2	0.2	0.02	0.002
10	2	0.1	0.01	0.001
10	1	0.1	0.01	0.001

Rules to be Observed in Weighing:

a.—Put the weights on the right-hand pan of the balance.

b.—Never put anything on the balance pans, or take anything off, while the balance is free to swing.

c.—Always use the forceps provided for lifting the weights.

d.—On commencing to weigh, find a weight which is too great, then, after removing this, try the succeeding weights in order. Never pick out weights at random.

e.—Do not put the small weights in a heap. Arrange them in order round the larger weights, which should be in the center of the balance pan.

f.—Place yourself opposite the center of the graduated scale while weighing.

g.—Do not remove any weight from the balance pan until the values of all have been written down, and check your result as the weights are replaced.

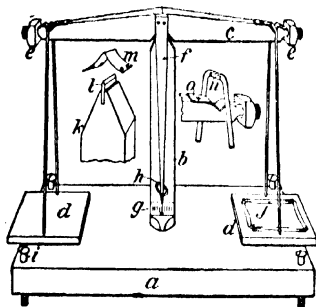
(A Simple Balance)

h.—Be careful to put the weights back in their proper place.

i.—Never attempt to weigh anything which is not quite cold. In addition to injuring the balance, the weighing will not be accurate.

This mode of pulverization, though particularly applicable to fibrous substances, is sometimes used for metals and hard materials. In the latter case the files may have finer and sharper teeth, and in both instances be particularly clean, and free from grease and dust.

To Make a Balance. A balance suitable for weighing small articles can be made easily and cheaply. Such a balance can be made sensitive to the weight of one-quarter of a postage stamp, and capable of sustaining a weight of several ounces. It is made chiefly of wood. All the parts are common articles, and only ordinary tools are required. Only certain features require careful attention; in other respects, rough work is permissible, says "School Exercises in Plant Production," by D. J. Crosby, in *Farmer's Bulletin* No. 408. The essential parts of a balance (see cut) are the base (a), the pillar (b), the beam (c), and the trays or pans, as they are usually called (d, d'). The beam is balanced by means of the balancing nuts (e, e'). The pointer (f) indicates on the scale (g) the effect of weights on the trays. A screw-eye (h) encircling the pointer serves to hold the



A Simple Balance

beam at rest, or permits it to swing, as desired, according as the screw-eye is turned. Four screws (i) at the corners of the base serve to level the balance.

In making the balance thoroughly dry, soft pine wood is preferable. Screws are

## Chemical Manipulations

### (A Simple Balance)

preferable to nails. The base is 12 or 14 in. long by 7 in. wide and 1 in. thick. The pillar is 1 in. square and about 9 in. high. It can be set in an inch hole in the center of the base. Care should be taken to have it stand perpendicular to the base. The upper end of the pillar is beveled on the right and left sides, as shown at *k*. A slot is sawed in the end to receive a knife edge, as shown at *l*. The beam is made from a stick 1 in. square and about 10 in. long. Its lower face is left straight; the other faces are beveled from the center to the ends, which are left  $\frac{3}{8}$  or  $\frac{1}{2}$  in. square. A notch 1 in. wide and  $\frac{1}{2}$  in. deep is accurately cut in the center of the flat or bottom face. This receives the central bearing (*m*) of the beam. An inch from each end of the beam a notch  $\frac{1}{4}$  in. deep is cut to receive the tray bearings. Each end is rounded to receive the balancing nuts. The nuts should cut well defined threads in the wood and move easily and smoothly. Applying a little soap to the threads helps this. A strong pointer (*f*) is firmly fastened to the beam by two or more screws. Its lower end is provided with a needle, colored black so as to be readily seen. The screw-eye (*h*) is placed near the end of the pointer and in the center of the pillar. It should turn easily and smoothly. When the balance is otherwise completed, turn the screw-eye so as to hold the pointer firmly, then paste to the pillar back of the pointer a strip of white paper (*g*) bearing scale marks, 1-16 in. apart, with the 0 mark of the scale directly back of the needle.

The three bearings of the beam are the most exacting features of the construction. Each consists of a knife edge, acting within a groove formed of bent tin. The knife edge (*l*) for the central bearing may be made of a pocket or case knife blade, or of a piece of hard brass filed to a straight, sharp edge. The knife edges for the end bearings are made by filing the lower side of the tray wires where they cross the beam, producing a straight, sharp edge (*n*) about  $\frac{3}{4}$  in. long. The tins forming the grooves of the bearings are made of thin tin, such as is used in oyster and vegetable cans. Bright pieces are selected. The central bearing requires a strip 1 in. wide and 2 in. long (*m*). It is bent across at the middle, the bend being lightly hammered flat on a flatiron. The ends are then separated. The halves of the strip curve somewhat, leaving a narrow angle at the bend. This tin is firmly held in the central notch of the beam by

### (Fuels)

four small screws. The tin strips for the end bearings are about  $\frac{1}{2}$  in. wide. They are bent in the same way as the other. One end of the strip is longer than the other, and is punched to receive a single screw holding it to the beam, as shown at *o*. The bending of the tin strips roughens the surface of the groove. It must be polished by rubbing the back of the point of a knife blade back and forth in the groove for some time. To insure success, the grooves must be very narrow to prevent side slipping, yet not so narrow as to bind on the knife edge. The highly polished groove and sharp knife edge produce the least friction, and increase the sensitiveness of the balance.

The trays are made of common No. 12 wire. The trays are 3 by 3 in. and  $\frac{1}{4}$  in. thick. Two holes near opposite edges receive the wires, which are bent in opposite directions beneath the trays, thereby holding them firm and level. If the trays tend to swing from front to back of the balance, the tins of the bearings may be slightly twisted by inserting a knife blade under them.

The balance can now be tested for use. When in working condition the pointed will slowly swing back and forth many times, and finally come to rest at 0 of the scale. It probably will not do this at the first trial. Set the balancing nuts at about equal distances from the ends of the beam, then stand tacks along the lighter beam arm until the two arms nearly balance. The tacks are then driven in permanently. If tacks are too tight, use brads or screws. The final balancing can then be done by properly moving one or both of the nuts. The proper adjustment of the balancing nuts should be tested each time the balance is used.

Weights, and objects to be weighed, can be held on the trays by cardboard dishes (*j*). A pair of forceps can be made from a strip of spring brass, or even of hickory wood, the points being properly sharpened.

A set of metric weights ranging from 20 grams to 1 centigram, and suitable for use with this balance, can be had for \$1 or less.

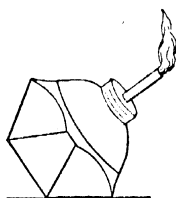
### Fuels.

The technologist has a wide choice of fuels at the present day. In certain localities wood is plentiful and is well adapted for various processes. It is, however, very sooty and cannot be used for many purposes. Charcoal is much in use and is not expensive. It can be used freely when a quick, strong heat is re-

## Chemical Manipulations

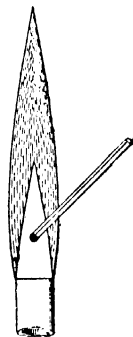
### (Fuels)

quired. Coal is an excellent fuel for general purposes. Anthracite coal is better now for general use than bituminous coal, although the latter makes the hotter fire. The deposit of soot is often very objectionable. Coke may be had almost anywhere and affords a clean, hot fuel. It is easily kindled. Gas is perhaps the best all round medium for the production of heat, except where manufacturing operations are to be carried on. A large number of devices calling for the use of gas



A Convenient Alcohol Lamp.

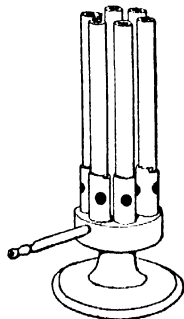
are illustrated in the present book. The Bunsen-burner is perhaps the most generally used type of burner. The flame should be blue, and the air regulation is usually accomplished by a ring at the bottom. There are scores of types of



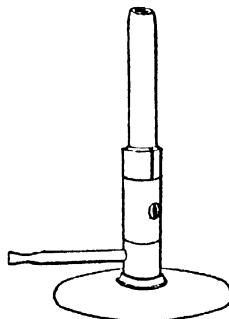
The Blowpipe Flame.

Bunsen-burners. For very intense heat the multiple Bunsen burners are recommended. Radio burners using the Bunsen principle are largely used in all of the mechanical arts. Gas can also be used to

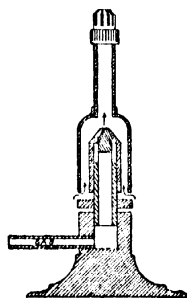
### (Fuels)



Multiple Bunsen Burner.



A Simple Bunsen Burner



Improved Bunsen Burner.



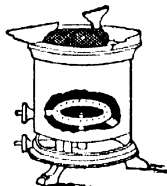
## Chemical Manipulations

### (Fuels)

drive a small hot-air engine for small power laboratories. There are many apparatus which give increase by stirring or agitating where a small caloric engine, or water or electric motor, can be used to advantage. All of the dealers in chemical apparatus furnish petroleum, gasoline and benzine burners as well, so that those who are away from large cities or towns will find their wants very well supplied.

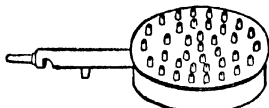
Where considerable quantities of hot water are required, a hot water heater run preferably by gas should be provided. They are not so expensive, and produce large volumes of hot water at moderate cost. Perfect control and safety of gas has a great deal to recommend it.

Electricity, though well adapted for all classes of technical work, is very little used owing to the great expense of the initial apparatus and the cost of current, and the length of time which is also required to heat up the hot plate or other device militates against the use of elec-



Burner for Slow Heat.

tricity. The writer has used electrical stoves for heating purposes, and he cannot see that they are of any advantage over hot plates heated by gas. Should it be desired, however, to install electrical apparatus, great care should be taken when



A Good Type of Burner for Evaporation

ordering the equipment that the voltage is the same as the feed mains, as otherwise the electrical apparatus will surely be destroyed.

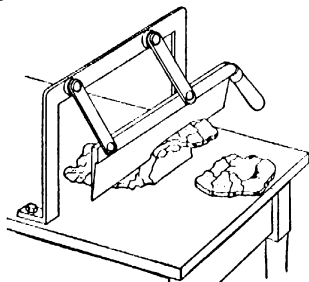
The blowpipe and charcoal are very useful things to have about the laboratory in connection with the Bunsen burner. Numerous small operations can be conducted with their aid. Blowpipe analysis

### (Contusion)

is a very valuable means of determining minerals and other substances.

#### I COMMUNION OR DIVISION OF SUBSTANCES

This operation is a mechanical process, by which the surface and points of contact of solid bodies are multiplied, thus diminishing the force of cohesion, and consequently promoting greater access to its particles, and enabling a more ready and rapid action of reagents upon solid matter. The means by which the division of solid matters is accomplished are manifold, and those who are using technical formulas will often have to resort to methods which are not in use even by pharmacists.



Draw Knife Slicer

#### Slicing.

This process applies to fibrous matters, and is largely practiced with a lever knife similar to that used by tobaccoists for cutting tobacco. This slicing renders the substance in better form for maceration, and, moreover, admits of readier desiccation, a necessary process when it is required to be further reduced under the pestle or by being grated on a coarse rasp. On a large scale, rotary cutters are in use, but they are far beyond the reach of the amateur.

#### Contusion.

This is a bruising operation, which is very frequently resorted to in order to reduce a substance to particles, by striking a plurality of blows. A mortar and pestle is perhaps the most used apparatus for this purpose. Corrosive or caustic matter should never be pulverized in metallic mortars, and such substances as chlorate of potash should only be reduced

## Chemical Manipulations

### (Contusion)

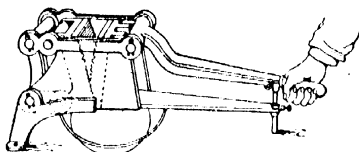
with the greatest possible care. Mortars are made of various materials, such as glass, wedgewood ware, wood and marble. Marble mortars are only recommended where the manufacture of toilet preparations, etc., is to be conducted on a considerable scale. Wooden mortars are useful in many cases. Boxwood mortars are the best wooden mortars. A sheepskin conical cover, with a hole in the center for the passage of the pestle, is recommended. It should be fastened around its rim and over its mouth with a string. Circular pasteboard and wooden covers are often substituted for the sheepskin cover. All substances of an organic nature should be previously dried, so as to afford greater facility for pulverization. A previous reduction of ores and coarse, hard substances into lumps, by concussion with a hammer upon an anvil, and of roots and like substances into slices or bits with a lever knife, are preliminary processes which greatly facilitate their pulverization. The substance to be struck upon the anvil can be wrapped in strong brown paper before crushing.

Silicious stones are pulverized much more readily after having been heated to redness in a crucible, and in that state thrust into cold water. This increased friability is occasioned by the unequal cooling of the mass. Metals, alloys, and the like, which are pulverized with difficulty while cold, may be readily crushed when heated to redness. When it is required to reduce the substance into small fragments only, it can be broken down by a succession of blows with the pestle. If the substance is very hard, the force of the arm should be added to the descending weight of the pestle, so as to impart power to the blow. A subsequent circular, grinding motion of the pestle, continued for a length of time, will further reduce these fragments to fine powder, and consequently this movement must be avoided when only a comminution is desired. The mortar should always rest on a sound foundation, and should be occasionally shaken during the operation of pounding, in order that the coarser particles which mount to the sides may be forced back to the center of the mortar so as to receive the full effect of the descending pestle. It should never be allowed to strike the sides of the mortar. If the substance is to be reduced to a fine powder, the process is greatly facilitated by operating upon only a small portion at a time, as the pestle is less liable to become clogged.

### (Grinding Mills)

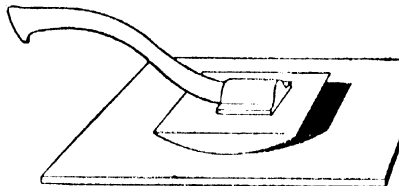
#### Grinding and Pulverizing.

These terms refer to the reduction of substances, by mechanical means, to coarse particles, this being usually referred to as grinding, while the word "pulverizing" is used to distinguish the reduction to fine particles. These processes are of great technical importance, and grinding mills are modified for the various purposes for which they are used,



Fine Rock Hand Crusher

and are manufactured by many concerns. Burr stones, roller mills, chaser mills, pebble mills, and mills having antagoniz-



Backing Board and Muller for Reducing Ores

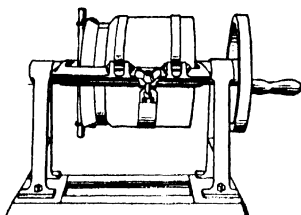
ing grinder plates, and also various crushing and disintegrating mills, and machinery almost too numerous to mention. Hand mills, on the principle of the coffee mill, are of a great deal of use. The drug-mill type is recommended. For certain classes of grinding, the ordinary meat chopper will answer, such as for the cutting up of herbs.

#### Grinding Mills.

Grinding mills may be purchased for all purposes. It is impossible to recommend any one mill which will be of universal application. If work is to be carried on on a large scale, an appropriate mill will prove an economy, even at first. The pebble mill is particularly recommended for general use. It consists of a porcelain jar, made of imported porcelain; these jars are impervious to the action of heat and such materials as ink.

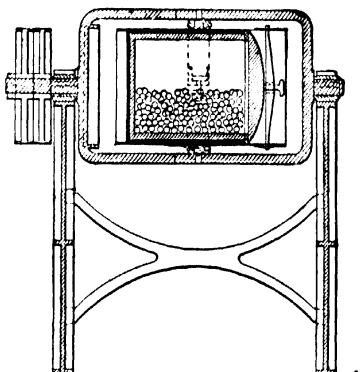
## Chemical Manipulations

### (Grinding)



Abbe Porcelain Jar Mill

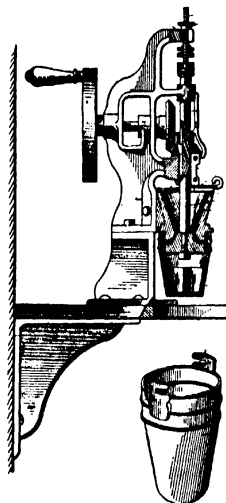
The effect is produced largely by friction: the sliding, tumbling and rolling inside of the mill of flinty pebbles or balls, which are mixed with the substances to be ground. The movement is caused by revolving the mill at a regulated speed. The type of mill which we illustrate will handle material up to 5 lb. in weight, and



Interior of Jar Mill, Showing Porcelain Balls

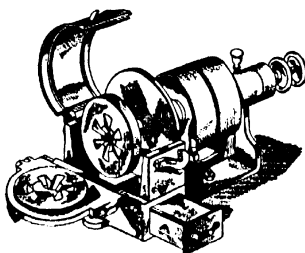
is turned at about 60 revolutions per minute. It weighs about 120 lb. Those who are going to manufacture on a large scale will find a large variety of mills of this type. The action is very well shown by our section of the mill. The mills referred to are particularly adapted for hard substances. Articles of a vegetable origin may be ground in a drug mill, which may be had of any size. A spatula is absolutely essential; in fact,

### (Trituration)



Hand Power Sample Grinder

two or three of them will not come amiss. A steel spatula, and one of horn or rubber should be provided. Strange to say, the spatula is one of the most convenient implements to have in the kitchen.



Braun Type of Pulverizing Mill

### Trituration.

This mode of manipulating with the pestle is applicable to those substances which are friable and fall to powder by being merely rubbed up by a circular or

## Chemical Manipulations

### (Sifting)

grinding motion of the pestle, and which would soften and become obstinate by being pounded. Chalk and the like, and most of the salts, are in the first category, the rosins and gum rosins in the second. The pestle is given a circular or spiral motion, accompanied by downward pressure. The operation is continued until pulverization is effected. Sand is added to facilitate the reduction of the rosins and similar substances, which cake under the pestle, only when they are intended for maceration or solution. Under other circumstances the medium would be an adulterant, on account of the impossibility of separating it. The process of trituration is also often performed with the aid of spatulas or flexible steel blades attached to handles, and is useful in the kitchen as in the laboratory. It is possible to get spatulas made of hard rubber for making preparations which contain corrosive substances.

### Porphyzation.

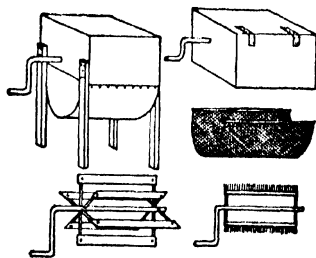
This means of pulverization is only employed when it is desired to give the comminuted substance the greatest possible fineness, and takes its name from that of the material of which the vessels in which it is practiced were formerly made. A small porphyry mortar, hemispherical interiorly, or preferably a slab and miller, is the apparatus employed. Flint, and even glass, which are equally as hard as porphyry, form economical substitutes for that material. Porphyzation is usually effected by rubbing the coarse powder between a flat slab and muller until reduced to an impalpable state. The circular motion of the muller disperses the powder over the slab, rendering it frequently necessary to collect it together in the center with a spatula, so as to keep it uniformly under the action of the muller. When the substance under operation is unaffected by water it may be moistened with that liquid, which, by converting it into a paste, facilitates its reduction, and prevents any waste by the escape of dusty particles. The powdered paste is easily dried by being dropped in dots upon a porcelain plate exposed to warmth. Those matters which are soluble in, or affected by, water, must be porphyzied in a dry state.

### Sifting.

The impossibility of reducing the whole of a substance at once to a uniform state of fineness by any of the preceding processes renders necessary an occasional sep-

### (Sifting)

aration, during the progress of pulverization, of the more comminuted portions from the grosser particles. This is effected by means of a sieve, of which there should be several in the laboratory. A wooden cylinder of about 4 in. depth, with an accompanying ring of the same materials, constitutes the frame, over which can be stretched a cloth of any required fineness. For coarser articles, fine brass wire is the best material for the cloth, but when the powder is to be impalpable, bolting cloth (raw silk), or gauze, is requisite. Sieves are also covered with haircloth, buckram, book muslin, and iron wire of different sized meshes, each of which has its appropriate application. The metallic sieves should have their cloths permanently fitted to them. For all the rest, two frames, as above described, one of much larger dimensions than the other, will serve, as it is only necessary to remove the ring when it is desired to substitute one kind of covering for another. The sieve of cloth, of graduated fineness, can be kept in some secure place, and withdrawn as wanted, and thus we have the economical means of possessing a full suite of sieves, from the metallic wire, through all the grades of fineness, up to the closest wrought bolting cloth. After the separation of the finer portions by the sieve, the coarser particles are again subjected to grinding and sieving as often as is necessary to convert the whole into the requisite state of uniform fineness. Where a more ex-



Home-made Sifter

tensive sifter is necessary, the one shown in our engraving can be used. Its construction will be readily seen by referring to the engraving. Horn scoops, or porcelain spoons or ladles, are the proper implements for transferring the contents of the mortar to the sieve. In some cases

## Chemical Manipulations

### (Levigation)

a stiff pasteboard card, being more pliable, is a convenient substitute. The use of the hand for this purpose should always be avoided, as a slovenly practice. A platinum, horn or bone, or—less preferably—steel spatula, may be used to detach the particles adherent to the sides of the mortar. A round jarring motion will force through some of the coarser particles, and thus destroy the uniformity of the powder, and hence the common practice of tapping it frequently against the side of the mortar should be abandoned, unless the state of fineness is immaterial. Some substances, however, as magnesia, etc., which obstruct the pores of the cloth, must be forced through in this manner, and even if necessary by a circular motion of the fingers over the interior surface of the cloth. This manipulation frees the meshes of the cloth from obstructions, but it must be carefully done, otherwise the safety of the cloth will be endangered. A sieve is also useful for the admixture of powders of uniform fineness.

#### Levigation.

Is that mode of mechanical reduction which is practiced by first rubbing the substance into a smooth paste, and then separating the finer from the coarser portions by agitating the bruised matters with water. After a sufficient repose the grosser and heavier portions subside, leaving the lighter particles still suspended in the water. This water, after decantation, gives a second deposit of an increased state of tenuity. The third or fourth decantation yields the powder of impalpable fineness. The time of repose between the decantations, unless great impalpability is required, should be limited, and only long enough to allow the deposition of the heavier portions. The coarse precipitates are collected together a second time, and as many more times as necessary, rubbed up as before, and treated with water until all the lighter portions have separated. This process applies only to substances unalterable by water. When uniformity of fineness is not at all important, one washing even suffices, and can be accomplished in the mortar without the use of glasses. Alternate poundings and washings will eventually reduce and remove the whole contents of the mortar. In washing over gold and other metallic ores, where only the heavier portions are to be reserved, the water may be allowed to flow directly into the mortar, which, being held in an inclined position, permits its exit, togeth-

### (Granulation)

er with the fine dusty portions, which are kept in suspension by trituration with the pestle.

This process of levigation is founded upon the different specific gravities of the coarse and fine bruised matters, and is, therefore, not only applicable for the separation of the particles of homogeneous matters, but also of equally fine matters of unequal densities. In the latter case it takes the name of elutriation.

All minerals for analysis which have to undergo ignition with alkalis should be previously levigated, in order that decomposition may be complete; for if the powder is not uniform, the larger particles will escape decomposition.

Pulverization in this manner, by uniformly comminuting the particles, promotes their equal expansion and the escape of contained moisture, and thus prevents the decrepitation of substances when heated.

The deposited powder must always be dried, by exposure, previous to subjecting it to any other process.

#### Reduction by Granulation.

The reduction of metals to a pulverulent state is effected by fusing them in a crucible, and pouring the melted matter, from an elevation, in a thin stream, very gradually, into a bulk of cold water, which is, during the process, kept in constant agitation with a stirrer. The fineness of the resultant granules is proportional to the slowness with which the fused metal was poured into the water. It is more convenient to transfer the metal from the crucible into a ladle, and project it into the water from that more handy vessel, which enables a frequent change of the position of the descending stream, and thus prevents the formation of clots instead of smaller and more solid granules. The fusion of zinc for granulation must be in a covered crucible, otherwise it becomes oxidized while hot, and partially sublimes by exposure in an open vessel. Zinc may also be finely divided by being beaten, while hot, in a heated mortar. The process of fusing metals and then agitating the melted matter in a wooden box until cool, reduces them to a state of minute division, but at the same time promotes their oxidation. For general purposes, however, it is not objectionable, and the particles of charred wood with which it becomes mixed can be separated by elutriation. The sides of the box are generally well chalked, to prevent any adherence of the metal; this also is separable by elutriation.

## Chemical Manipulations

(Solution)

### Elutriation.

Elutriation is a process of obtaining substances in a very fine powder by the aid of water. The heavier particles fall to the bottom first, and the lighter particles follow. Advantage may be taken of this principle in constructing an elutriating apparatus, which may consist of a large iron pan having 4 or 5 openings and valves, so that a portion of the liquid can be drawn off containing finer or coarser particles. Elutriation has been aptly called water sifting. It is an extremely economical process, especially when carried on on a large scale.

### Pulverization by Intermediation.

This mode is both mechanical and chemical, and applies particularly to the noble metals, in foil, which are difficult of pulverization. Honey, sugar, salts, etc., are the most usual media. By binding the particles together it assists their minute division, and prevents their escape from the mortar. The addition of boiling water solves out the medium without action upon the metallic powder, which then only requires to be thrown upon a filter and dried. Phosphorus may be finely divided by fusing it with alcohol over a water bath and shaking the contents of the flask until thoroughly cooled. The phosphorus subsides at the bottom in pulverulent form. Camphor, which is obstinate under the pestle, readily yields to its power when mixed with a few drops of alcohol or ether to destroy its elasticity.

## II

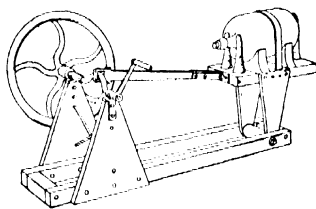
### SOLUTION AND EXTRACTION

#### Solution.

When a substance added to a liquid is wholly or partially taken up by that liquid it is said to be soluble therein. The liquid employed is termed the solvent, and its combination with the dissolved particles a solution; and if the liquid has exerted its solvent power to the fullest extent, then the solution which it forms is said to be saturated, because it can hold no more. The variable degree of solubility in different liquids serves as a distinctive characteristic of bodies, particularly those which are solid. Solution is either wholly mechanical, or else chemico-mechanical. In the first case it is a molecular division of a body, or, in other words, a diffusion of its particles in an appropriate liquid without any alteration of its original properties, save as to

(Solution)

form and cohesion. Thus, for example, an aqueous solution of sugar or salt yields the whole of its charge by evaporation, and one of sulphate of lime by addition of alcohol, in which it is insoluble. Eth-



Agitator for Liquids

real or spirituous solutions deposit their dissolved matter by distillation or crystallization; and some other kinds, that of gutta percha, in chloroform, for instance, by precipitation with ether or alcohol. When the dissolved particles are thus recoverable again in an unaltered state, chemically considered, their solution may be styled *simple*.

In the second case, chemico-mechanical solution, in contradistinction to that which is purely mechanical, is a process requiring the modification of a body by chemical action previous to its solution. Thus, for example, copper, iron, or any other base or acid, insoluble in the ordinary solvents, may be readily taken up by liquid acids or bases. But the liquid holds in solution a newly formed body entirely dissimilar to the original substance in properties, as appears when it is separated. In this, therefore, consists the difference between a simple, or mechanical, and a chemico-mechanical solution. As examples of this latter, iron may be dissolved in dilute sulphuric acid, but in the act is transformed into copperas; alkalis are taken up by acids, but become altered to salts; and oil, in being dissolved by potassa solution, is changed into soap. Hence it is that the chemical reaction is a preliminary step requisite to promote simple solution. The point of saturation in chemical solution is that at which the two bodies, invariably of opposite properties, have combined in proportions adequate to neutralization.

Solution is one of the most important processes in chemistry; it not only facilitates chemical reaction, but allows the separation of soluble from insoluble bodies, or parts of the same, and consequent-

## Chemical Manipulations

### (Solution)

ly the purification of the solution by subsequent filtration, evaporation and crystallization.

As regards the power of dissolving the greatest number of substances, water is the first in the rank of simple solvents, alcohol the next, and ether third. Then follow spirits of turpentine, pyroxylic spirit, the volatile and fixed oils, chloroform, and a host of other liquids suitable to particular substances. Of the alkalis, aqua ammonia, or potassa, are most used; the former preferably because of its volatility, and that of most of its salts. All of the common acids are employed, though some few only are of general application, such as the muriatic, nitric, sulphuric, acetic and tartaric.

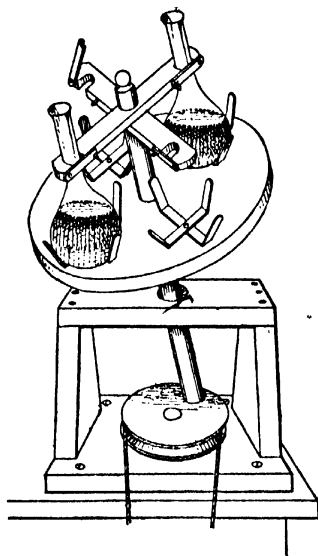
A very convenient way of testing the solubility of a substance is by means of a test tube. If solid, a small portion, in powder, is to be introduced, and covered with distilled water, or the solvent to be used, and repeatedly agitated by the hand, the forefinger closing the mouth to prevent the escape of particles. If the matter is wholly soluble, there will be no deposit at the bottom of the tube; if partially soluble, the deposit will have decreased in bulk; if totally insoluble, it will occupy the same space as at first. To determine as to the two latter results, a minute portion of the supernatant liquid is decanted and evaporated in a small platinum spoon, or strip of window glass, over a spirit lamp; if a residue remains, it indicates that matter has been taken up. When heat is required, the lamp affords a convenient means of application. The procedure in such cases is the same as that above indicated.

1.—There are certain conditions which greatly facilitate the solution of substances: First, comminution, which increases the extent of surface; second, agitation, which promotes the frequent contact of all parts of the surface with fresh portions of solvents; third, the freedom from impurity of both the solvent and the body to be dissolved; fourth, it is also influenced by the quantity and state of dilution of the solvent; fifth, by the temperature; sixth, by the mode in which the process is conducted.

2.—Agitation is effected by stirring with glass rods when the containing vessel is open at the top. The rod should be rounded at the end over the blowpipe flame, and to prevent its rolling from the table or top of the vessel upon which it should be placed, may be square, instead of cylindrical, as usual. A very convenient and effective mode of bringing all por-

### (Solution)

tions of the liquid successively in contact with the substance to be dissolved is to place the latter in a colandered diaphragm suspended beneath the surface of the liquid. The first stratum of liquid, in becoming saturated, increases its density, and consequently descends, and dis-



Power Mixer for Liquids

places a lower and fresher portion, which, being in the same way surcharged in its turn, gives way to successive strata, and so the operation continues until the whole of the matter, or so much as can be, is taken up. This mode keeps the substance in constant contact with new portions of liquid, and is, in fact, a kind of *displacement* process. When flasks or bottles are used, the same effect may be produced by repeated shaking. Trituration in a mortar, and alternate decantation and fresh additions of the solvent, greatly facilitate the solution of solid substances.

3.—The purity of the solvent is an important consideration, for if it contains foreign matters they may impart a dissolving power which is not inherent in

## Chemical Manipulations

### (Solution)

the pure liquid, or diminish that already possessed by it.

4.—In regard to the quantity and state of dilution of a solvent, it must be remembered that some substances require more of it than others for their solution, and that it should be in a greater degree of dilution. Therefore, in examining the solubility of a body, always commence with small quantities, and increase both quantity and strength gradually as may be required.

5.—Temperature exerts a considerable influence in the solution of bodies, and though in a few instances, as in the solution of lime, magnesia and anhydrous sulphate of soda in water, its elevation impairs the power of the solvent, yet, as an almost universal rule, it facilitates its action. The temperature must be adapted to the nature of the solvent and the substance to be dissolved, and of the solution formed.

It may be as well to mention that the caloric rendered latent at the moment of the liquefaction of a solid, which is being dissolved in a liquid, causes a decrease of temperature. Solution in volatile liquids should be, in most cases, performed in the cold, and, when of small quantities, in narrow-necked flasks. If heat is required, especially when the vapors are inflammable, a retort or covered still must be used; and if the distillate is valuable, a recipient may be annexed to receive as much as comes over.

The mode of effecting solution varies with the substance under process: Maceration, decoction, infusion, digestion, boiling and displacement have each and all appropriate application.

In ordinary solution, the solid should be added in portions, and sufficient interval allowed for the solution of those in the liquid before fresh are added. In case of foaming or effervescence, an additional amount of fluid will produce a calm.

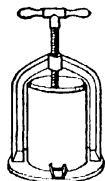
Some volatile substances which are insoluble in water under ordinary circumstances are taken up by it in the state of vapor. For this purpose both should be distilled together.

When solutions emitting corrosive or disagreeable fumes are being made in open vessels the operation should be conducted under a hood the barrel of which connects with the chimney flue, so as to insure their exit. The containing vessels should be those which resist the action of heat, acid, alkalis and corrosive liquids.

For making saturated solutions of most

### (Maceration)

substances, ebullition is necessary. For this purpose the solid must be boiled with the solvent until the latter, on cooling, deposits some of its charge. The cooled solution is then to be filtered.



Hand Press

### Expression.

By expression we are to understand the process of separating solids from liquids by means of force. Presses are usually used for expression, and are divided into screw presses, lever presses, hydraulic presses, etc. The ordinary screw press shown in our engraving is of great use. The ordinary meat chopper, with a knife in one piece, and costing \$1.50, is a valuable aid to expression. Horizontal screw presses of the same general appearance express as well as cut.

### Maceration.

The soaking or steeping of a substance in a liquid, at the ordinary temperature, is termed maceration. It is almost exclusively applicable to organic substances, being most frequently resorted to as a means of hastening and facilitating the after solution of the extractive parts of hard, compact or impervious wood, roots, stems and leaves, by the more active methods of *displacement* and *ebullition*. It is employed when the soluble principles are alterable by heat, and is also made use of to effect the solution of a substance containing several principles, the solubility of which varies with the temperature applied, as it leaves those which are not taken up in the cold to be acted upon by the aid of heat. Thus, for example, in the treatment of most vegetable substances, starch, which is generally present, and is only soluble at the boiling point of water, will remain untouched, while all other principles soluble without heat can be separated from it.

The mode of performing the process is merely to place the solvent and the substance to be dissolved together in a



## Chemical Manipulations

### (Digestion)

vessel, and allow them to remain a longer or shorter time, according to the nature of the substance. For ordinary purposes, a loosely covered pan of blue stoneware is very convenient. In delicate operations, a beaker glass, or solution jar, is more appropriate. When the solvent is volatile, a wide-mouthed, stoppered bottle may be used.

#### **Infusion.**

This process is likewise applicable almost solely to organic substances. Instead, however, of the solid remaining in contact for a length of time with the solvent, the latter is first heated to boiling and then poured upon the former.

This mode is used for the exhaustion of flowers, leaves, roots, seeds, and other substances of delicate texture, which are easily penetrable and readily yield their soluble matters; and especially for the purpose of extracting volatile ingredients. The heat applied to the solvent increases its energy; but as the material is only in contact for a limited time, the interval between the commencement and completion of the operation is not sufficient to affect the material or solution, even though one or more of its components are alterable by heat.

#### **Decoction.**

This mode of solution, which is so important to the pharmacist, is chiefly employed for the purpose of exhausting those vegetable substances the components of which will not readily yield to other means. It is merely an extension of the last process, and consists in that contact of the material to be dissolved with a hot solvent in a covered vessel, which is continued until all soluble matter is taken up. Most volatile matters are expelled by decoction, but those which are insoluble, save by prolonged action of heat, are dissolved or suspended, as it were, by favor of other principles present. Decoction is only used with liquid solvents which are not decomposable by heat.

In all of the preceding processes, as well also in others in which solid vegetable matter is subjected to the solvent action of liquids, the colandered handle of tinned wire is most useful for transferring the residue to the press, for removal of any retained liquid.

#### **Digestion.**

This mode of solution differs from maceration in requiring the assistance of heat, and consists in exposing a body to

### (Baths)

the prolonged action of a liquid in a covered vessel, at any temperature between 30° F. and several degrees less than the boiling point of the solvent. The method of heating varies with circumstances, and can be by a gentle fire, or by the sand, steam, water or saline bath, as the nature of the operation requires.

In analysis, glass or platinum vessels are used, but in less important operations those of other materials are more convenient and economical.

A very important advantage of digestion is that it allows the perfect solution of all soluble portions of a substance without modifying the nature of the solvent. It is especially useful for the decomposition of ores, minerals, and other substances with difficulty acted upon by acids or other solvents, and also for effecting the synthesis of compounds requiring a long continued heat. Moreover, it is very available in preparing alcoholic and aqueous solutions, medicinal oils and other pharmaceutical products.

#### **Evaporating Dishes.**

Special evaporating dishes of porcelain, glass, or enameled steel, can be purchased of all dealers in supplies, and are especially recommended. Broad, shallow vessels should be usually selected. If glass evaporating dishes are to be used, they should be heated in a sand bath. The evaporation is aided by stirring; glass rods, or porcelain or wood stirrers, should be used. If the reader is going to use large quantities of the same materials, various means of stirring artificially will present themselves. Evaporation of many substances should be carried on under a hood, which may be of sheet iron or galvanized iron, like the hood over a blacksmith's forge, or the work may be carried on in an evaporating chamber, which may be likened to a closet with the lower portion boarded up so that the floor of the closet is of a convenient height to be reached with the hands. There should be a closed window in the closet, which should be well ventilated to the outside by galvanized iron or asphaltum painted ventilating tight. All the arrangements for gas, etc., should be at the front of the evaporating chamber, so that it will not be necessary to reach over hot plates, etc.

#### **Steam Baths.**

Steam is very largely used in the arts for maintaining a steam bath. The steam may or may not be under pressure. Where steam without pressure is used, either a

## Chemical Manipulations

### (Drying)

steam jacket is constructed, or the live steam may be conducted directly into the top. A steam distributor can be readily constructed with the aid of pipe or elbow Ts, etc., and this tends to distribute the heating more equally, and serves to mix the ingredients which are being heated. If considerable operations are to be carried on, the use of steam under pressure is recommended for many purposes. Superheated steam, of course, raises the temperature considerably; thus, if steam at the ordinary atmospheric temperature is to be increased, a temperature of  $240^{\circ}$  may be obtained by a pressure of 40 lb. to the square inch, while with a pressure of 80 lb. to the square inch a temperature of  $312^{\circ}$  can be obtained. It is possible to build a water bath with a jacket in which steam at high pressure is generated directly in the water jacket.

### Attemperating Baths.

There are many substances which have to be treated moderately to heat, so as to prevent the decomposition or destruction of the substance which is being treated. This is especially the case with medicinal preparations. Various attemperating baths have been devised, many of which are extremely ingenious, and are fully illustrated in the catalogues of dealers in chemical apparatus. The sand bath is one of the best-known means of producing an even heat without burning. It can be readily made by putting sand in a pan over the naked fire and putting next in porcelain or other vessels as it becomes necessary. Oil and paraffine baths are used for certain purposes, as are also glycerin baths. The water bath is perhaps the most widely distributed and best-known means of regulating the heat which is applied to substances. The water bath may be extemporized, or the special baths furnished by dealers in chemicals may be used, which are more satisfactory, being specially adapted to the purpose. Salt-water baths are also largely used. The action of salt in the water is to raise the boiling point.

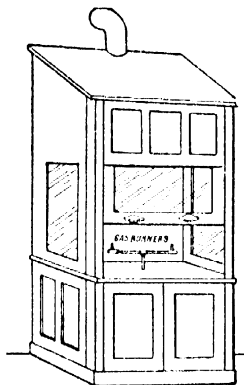
## DRYING AND DESICCATING

### Mechanical Methods.

Foremost among mechanical appliances for this purpose ranks the centrifugal machine, or hydro extractor. In principle, this apparatus consists of an upright drum, which can be made to revolve with great velocity on a vertical axle. The drum may have its sides constructed of sheet metal, perforated with a multitude

### (Drying)

of fine holes, of wire gauze properly supported, or of basket work, according to the nature of the substances to be treated. The drum, being charged with material, is set in quick rotation. The water present is thus expelled through the perforated sides, in the form of a fine shower. This



Hood For Chemical Work

process is exceedingly well adapted for removing the greater part of the moisture from cloth, yarn, unspun wool, etc.; also from crystalline and granular substances. It is not so well adapted for drying wet powders, pastes, etc., since in such cases a very considerable proportion of the solid matter is projected away along with the liquid, so the holes may get choked up. Thus it has not hitherto been found satisfactory for drying sewage mud. Its use requires, further, special modifications where the liquid to be got rid of is not pure water, but holds useful or hurtful matters in solution. A recent very simple improvement has considerably extended the use of the hydro extractor. The materials, instead of being put into the drum loose, are inclosed in bags of some suitable material, thus preventing the dispersion of the solids. This method has been very successfully adopted with butter. It must, however, be remembered that no substance, especially if of organic nature, can be rendered absolutely dry by the use of the hydro extractor.

Another mechanical agency for desiccation is the press, more especially that device known as the filter press, which

(Drying)

has proved itself invaluable for separating solids from fluids when the latter largely predominate. This apparatus contains a number of cells, each consisting of a couple of cast-iron plates, lined, when in use, with suitable cloths. The inner surface of each plate shows a number of ridges. The liquid paste is forced by a pump or press into each cell, through an aperture, and the water escapes through the cloth, and trickles down between the grooves formed of the ridges to the pipe at the bottom.

The filter press, like the centrifugal machine, only expels a part of the water in mud, etc.; thus, if a sewage mud contains at the outset 90 to 95% of moisture, it may be reduced by the filter press down to 50 to 60%, according to the time during which the pressure is maintained. It is only in a few cases that hydraulic presses, screw presses, etc., can be employed for desiccation.

**Small Hot-Air Baths or Closets for Laboratory and Other Purposes.**

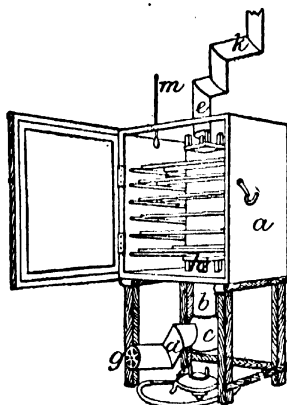
(a) The ordinary steam or hot-air chambers for laboratory use, although meeting the most of the requirements for which they are designed, have the disadvantage of being more adapted for experimental than manufacturing purposes. The want of a cheap and convenient apparatus induced Mabien to bring under notice a design, due to Hyslop, one of his apprentices, who intended it for drying photographic gelatine plates; but, by slight modifications of the interior, it is perfectly adapted for the purposes of the laboratory.

The chamber consists of a strong wooden box, *a*, 18 in. high by 18 in. wide, and 14 in. deep. To the front a door is attached, hinged in this instance, but a vertical-sliding movement would be more convenient. To two sides of the box are fixed wooden supports, which serve to receive teak spars for supporting drying trays or evaporating dishes. The bottom of the box has a perforation of 3 in. diameter, into which a zinc cylinder, *b*, is securely fitted, and to this is soldered the upper end of a copper cone, *c*, with a flat bottom, while into this latter a bent tube of 2½ in. diameter and 9 in. total length is securely inserted in the manner shown. A corresponding perforation is made in the top for receiving a tube to answer the purposes of a chimney.

Using a Bunsen burner or a spirit lamp as the source of heat, the flame is directed to the bottom of the cone, *c*, with the result that the heated air ascends into the

(Drying)

chamber, being diffused by means of a dispersion board, *h*, about 4 in. square, which is placed over the orifice. At the end of the tube, *d*, is fitted a "hit-and-miss" regulator, *g*, which consists of a series of triangle-shaped holes, with a re-



Laboratory Drying Closet

volving disc behind, so that the size of the apertures can be increased or diminished, thus enabling the amount of air entering to be under partial control. The highest temperature to which the air in the chamber has been raised is 180° F. (82° C.) which is sufficiently high for most operations. If a uniform temperature of say 100° F. (38° C.) be required, the admission of air must be regulated accordingly by means of the regulator, *g*, accuracy being insured by the insertion of a thermometer, *m*, into a perforated cork fitted into a ½-in. aperture on the top of the chamber. By this means there is no difficulty in keeping within 2½° less or more of the desired temperature.

If a rapid current of warm air is desired, this can be had by placing an angular tube, *k*, on the top of the chimney, *c*; by heating the angle of the tube a draught is quickly created.

It is desirable in some cases to filter the admitted air; this can be done by stretching a piece of lint or other suitable material between the regulator, *g*, and the tube, *d*, by which means dust particles are effectually excluded.

## Chemical Manipulations

### (Drying)

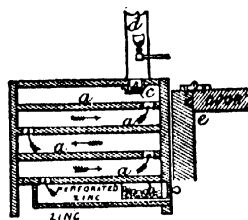
The metallic parts of the apparatus being made to screw off and on, they can be detached at will, so that we can thus have a series of wooden chambers suited to different purposes. In this instance, the chamber being intended for drying gelatine plates, it was of course constructed so that the light would effectually shut out, but it is obvious that a small glass window would add greatly to its value for most other purposes. The advantages of this chamber are its simplicity, its perfect security against overheating, and its small cost—it can be made for a few shillings. It is light and easily handled, and is always ready for work, a current of pure hot air being obtained in a very few minutes after the application of the Bunsen flame. It is specially adaptable in the preparation of granular and scale compounds, for drying precipitates, hardening pills previous to coating, and in other operations requiring a current of hot air.

(b) A writer describes his drying closet as being made of teak 1 in. thick, with light-tight door in front; the ends project beyond the bottom to form legs; the top and bottom are both double (4 in. apart), and the air enters through a slit 3 in. wide, and reaching right across the box. This slit is at one end, and the air has then to pass along the double bottom to the other end, where it gets into the box through a similar slit, thus keeping out the light; and it gets out at top in a similar way. Over the exit at top is fitted a tin or copper chimney 3 ft. high, in which burns a Silber lamp, giving a good draught, and drawing a large quantity of air through. Inside the box are brackets (each having a leveling screw through it, with the point upward), projecting from the ends, on which are laid plate-glass shelves cut the width of the box, but 3 in. shorter, so that when the shelves are in place, if one is pushed close to the right end of the box and the next to the left, and so on, the air has to pass backwards and forwards over the plates. His box has 3 shelves, 13 in. wide and 32 in. long, and will dry 6 photographic plates 15 in. by 12 in., or, of course, anything less that will lie in the same space. Some have an arrangement for drying and warming the air before it enters the box; but this sometimes induces blisters and frilling. Shelves should be far enough apart to get the hand in easily, say 6 in.

Our next engraving shows a sectional view of another form of photographic drying box. *a* are shelves on which to put plates. In the drawer, *b*, are placed

### (Drying)

some lumps of calcium chloride. This absorbs moisture very rapidly, and the air in passing through it is thoroughly dried. In the flue, *d*, is a small gas burner, and below is a light trap, *e*, made of tin. The gas jet is for the purpose of causing an extra current of air to pass over the plates. It is better to confine the plates as much as possible to the 2 middle shelves, as there they are sure to be safe. At *c* is a sketch showing how



Photographic Drying Box.

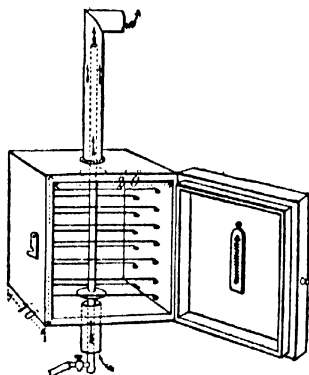
the door of the box should be rebated into the side.

(c) England's drying closet is simply a light-proof box with wires stretched across the interior to support the articles to be dried; e.g., photographic plates. Through the center runs a 1-in. gas pipe, open at both ends, with a small gas jet burning inside at the lower end. At the top and bottom of the box 2 draught holes are cut, to which a tin tubing of about 3 in. diameter is attached. The gas tube gets warmed with a very small jet of gas burning in it, a mere pin-hole being sufficient exit for the gas. This warms the air in contact with the tin tube, and also slightly the air inside the cupboard. The consequence is, that a current of slightly warm air is set up, and circulates among the plates while supported on the wires, and the drying of the films takes place rapidly. Some 5 to 6 hours is a sufficient time in which to dry the plates, while without the gas jet it would take 24 hours or more. In the inside of the cupboard, and near the top and bottom, are placed 2 cardboard discs to stop the possibility of any stray light entering, and as the whole affair is placed in the dark room, the chances of any such access even without it would be small. Inside the cupboard door is a thermometer, and the jet is regulated so that a temperature of about 70° F. is indicated—80° would do no harm to the plates; beyond that tem-

## Chemical Manipulations

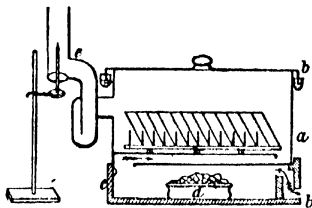
### (Drying)

perature it might not be safe to go. The small gas jet used is the same as seen in tobacconists' shops; the hole in the end is plugged up, and a very small hole drilled at the side.



England's Drying Closet.

(d) A photographer adopted a large zinc case with a lid of the same material. He cut a long opening at one end of the bottom, and had another bottom soldered inside with an opening at the opposite end. He then had a Russian iron chimney fastened on one of the sides, and fitted this with a gas flame placed as shown, so that it might produce the necessary current of air. To make the cover fit air and light-tight was rather more difficult. This, however, he managed in the following manner. He had a rim soldered



Calcium Chloride Drying Box.

all round in the shape of a gutter, the edge of the lid sinking into the bottom of the gutter, and then filled the latter with small shot, and thus obtained a most per-

### (Drying)

fect closure. This box has been in use ever since, and, with the addition of a wooden tray, and of an iron vessel full of calcium chloride, has done very good service. In the figure, *a* is the zinc case; *b*, gutter filled with shot; *c*, wooden tray; *d*, calcium chloride vessel; *e*, Russian chimney.

(c) The usual form of hot-air baths used in laboratories are, almost without exception, affected by drawbacks, particularly the following:

1.—Either the temperature in the upper and lower parts is different; or

2.—The temperature differs with the duration of heating; or

3.—It can only be raised to a moderate degree; or

4.—Finally, it can be kept up only by a relatively large consumption of gas.

Meyer proposes to remove these defects in the following manner:

Equality of temperature may be attained by applying the heat at the side—never below—and by taking care that the flame never comes in actual contact with the metal. The space to be heated is to be surrounded with the hot products of combustion of the flame mixed only with the smallest possible excess of air, in such a manner that a triple layer of heated gases, proceeding from without in-

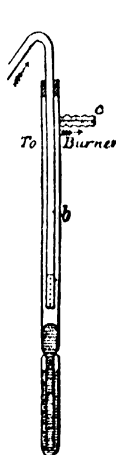


Fig. a

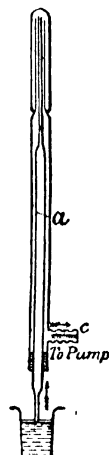


Fig. b

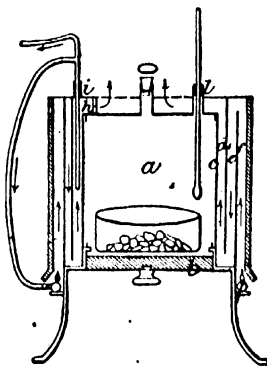
## Chemical Manipulations

(Drying)

ward, surrounds the inner mantle. Besides, the outer, or hottest layer, must be protected from too rapid cooling by applying a suitable coating of bad conductivity for heat.

Equality of temperature for any length of time may be best attained by a regulator constructed on the principle of Andree's, which contains, in a small, confined space a small quantity of a liquid having a boiling point a trifle below the degree of temperature to be maintained. The author prefers the modified form suggested by Kemp, and improved by Bunsen, which is wholly constructed of glass except the lower end of the gas tube, this being made of perforated sheet platinum.

In order to fill it, the gas tube, *a*, Fig. *a*, is temporarily replaced by a tube, *b*, drawn out at both ends and reaching down into the reservoir of the regulator (top of Fig. *b*). The lateral branch, *c*, is now connected with the vacuum pump, the whole inverted (as in Fig. *b*), and contracted end dipped, first into the liquid to be used as regulator, and then into mercury, until the chamber is almost, but not quite, full. The apparatus is now turned over, a little more mercury poured in, and the gas tube, *c*, is inserted. When using the apparatus, the gas tube is first drawn upwards, and, when the proper temperature has been reached, pushed down into the mercury, until the supply of gas is reduced to a minimum. By cautious adjustment, it is easy to find the position at which the tension of the vapor developed in the tube raises the column



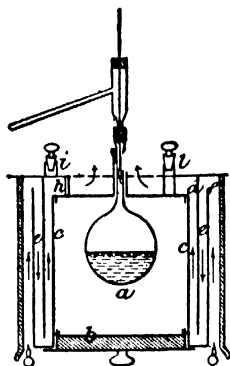
Drying Chamber.

(Drying)

of mercury sufficiently to just close the orifice of the tube, *c*, at the proper temperature. As the air bath cools off very slowly, but heats up rapidly, it is of advantage to adjust the regulator to a slightly lower temperature than actually required.

It is best to have a series of such regulators, charged with substances, the boiling points of which are about 30° C. apart, and to keep them in a proper receptacle for use. Suitable substances are, for water baths: ethyl chloride, ether, carbon disulphide, mixtures of ether and alcohol, benzole; for air baths: water, toluol, xylol or amyl alcohol, cymol or oil of turpentine, aniline or phenol, naphthalene, diphenyle or diphenylmethane, diphenylamine, and perhaps also anthracene. It is not at all necessary to use these in a pure state, particularly those which are solid at ordinary temperature, since they melt more easily when impure. Only very little of solid substances should be introduced, for the excess distils off, and may clog up the gas tube.

The annexed engraving shows an approved air bath.

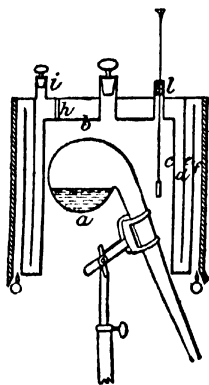


Drying Air Chamber Arranged for Distillation.

It consists of 4 concentric walls of sheet copper, 2 of which are attached to the upper plate, and the others to the bottom plate. It can be arranged for the dry distillation of substances which should not be heated beyond a certain point (for instance, citric acid in the preparation of aconitic acid, etc.).

## Chemical Manipulations

### (Drying)



Drying Chamber Arranged for Dry Distillation.

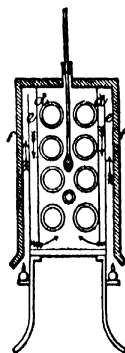
The innermost cylinder\* surrounds the space, *a*, to be heated, which is closed from below by a double bottom, *b*, fastened by a bayonet-clamp. The upper cover also double (the 2 walls being kept parallel by inner supports, of which one is shown at *h*), has 2 tubulures, one, *l*, for the insertion of a thermometer, another, *i*, for the regulator, and another for the escape of the heated vapors. To this cover the 2 cylinders, *d* and *f*, are attached, while *e* and *c* are soldered to the bottom piece, which is also provided with 3 legs. The heating is done by a brass ring attached to the legs, with a supply of gas controlled by the regulator, *i*. The ring has holes of 2 to 3 mm. bore in intervals of 3 cm. The little flames thus produced burn quietly and may easily be regulated. With the same amount of gas which is furnished by a gas cock supplying an ordinary Bunsen's burner, the space in a (= about 5 l.) may readily be heated to 300° C. and over, even when it is not closed below. But in order to obtain this result, the intervals between the several cylinders, in which the products of combustion circulate, must not exceed 10 mm. Besides, the outer cylinder, *f*, must be protected with a non-radiating cover. The best, for this purpose, is a layer of asbestos (in sheet), to be applied so as to leave a little space between it

\*The air chambers illustrated above are not square, but round. The illustrations represent a vertical section through the center.

### (Drying)

and cylinder *f*, which space is to be filled out with silicious earth ("Kieselguhr") or mineral wool.

If tubes are to be heated, the modification shown herewith may be used. It is also here of importance that the channels through which the warm air circulates are very narrow, scarcely 1 cm. apart. The 8 iron tubes pass through the narrow walls, which latter are not double but covered with little flaps hinging upwards (one corresponding to each tube), as closely as possible fitting to the surface of the outer cylinder, but remaining slightly distant from the ends of the tubes. In case a glass tube (inserted in one of



Drying Chamber Arranged for Tubes.

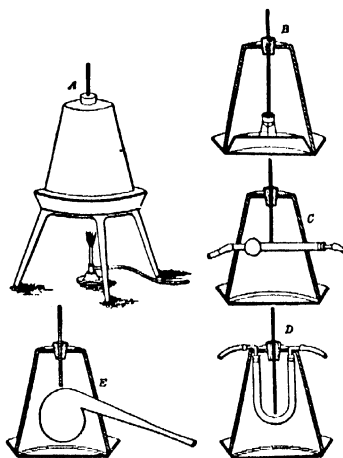
the iron tubes, for being heated) should explode, its fragments are caught by the loosely hanging flaps. Between the iron tubes, a Babo's regulator may be inserted.

For special uses the above forms of air baths may be still further modified. It is, however, of importance to remember that the heated gases should surround the space to be heated in a triple layer; that the hottest layer should be near the outside, and that the intervals between the walls should admit as little excess of air as possible. The gases escaping above must have the property of extinguishing a glowing splinter of wood.

(f) The air bath ordinarily used in chemical laboratories for drying precipitates, for making determinations of water by loss, and for similar purposes, is usually a rather expensive piece of apparatus. The iron or copper closet, with its door, tubulure for thermometer, shelves, stand,

## Chemical Manipulations

(Air Baths)



Air Baths.

etc., works no more satisfactorily because of its somewhat elaborate or difficult construction. In our engravings are shown a simple substitute for this apparatus, that as regards simplicity cannot well be excelled, while its other good features certainly operate to commend it. It consists of an inverted flower pot sustained upon an ordinary tin pan or sand bath, the whole being carried by a tripod or retort stand. The aperture at the top serves to receive a perforated cork through which a thermometer is passed. An ordinary Bunsen burner is used to heat it. As the sand bath directly over the burner becomes very hot it is advisable to invert a second smaller sand bath within the first as shown in B. This prevents too direct a radiation of heat from the hot metal. Upon this the little stand or bent triangle supporting the crucible or watch glass containing the substance to be heated may be placed. The thermometer should be thrust down through the cork until its bulb is near the substance to be dried, so as to obtain a correct indication of the temperature at that point. The entire arrangement is shown in external view in A.

To place the vessel in it or to remove one, the flower pot is lifted off the sand bath. It will be observed that its porous nature provides a species of ventilation,

(Air Baths)

while its composition assures it against corrosion. It even protects the plates below to a considerable extent, as drops of water or other fluid cannot run down its sides as it cools.

But convenient as it is in the rôle of air bath for simple drying operations, it will be found more so where drying tubes or retorts have to be manipulated at constant temperature. The flower pot can be perforated at any place, and holes of any size or shape can be drilled and cut through it with an old knife, file, or other implement. Thus in C it is shown in use for drying a substance at constant temperature in a straight drying tube. The holes to receive this tube can be drilled in a few minutes. The arrangement as shown is of the simplest kind, but if the usual bath was used, it would require a special tubulation to be introduced or contrived for the tube to pass through. Flower pots cost so little that there need be no hesitation in preparing them for special uses.

In D a U tube is shown as being heated, while in E a retort occupies the bath, and is in use for fractional distillation or other operation requiring a constant temperature. In all cases it is better to use the second bath inverted within the chamber. It conduces greatly to the maintenance of an even temperature throughout the whole space. A hint may also be taken from the heavy drying plate formerly perhaps more used than at present. If for the light metal pans a heavy plate of  $\frac{1}{2}$  in. or more in thickness is substituted, the temperature will not be subject to as rapid variations, and less difficulty will be experienced in keeping a constant temperature. The tray furnished with the next large size of pot may be used instead of the sand bath upon which to rest the inverted flower pot. This gives an absolutely non-corrodible construction.

When the bath is in use for drying substances, its top, which is at a rather low heat, affords an excellent place of drying precipitates wrapt in their filter papers. It acts in two ways. It is generally just hot enough to dry them with reasonable quickness without danger of spurring, and it also acts by capillarity to absorb the water directly. It represents in the last respect the porous tile or blotting paper—appliances too little appreciated by chemists here. It must be remembered that the drying of a precipitate by evaporation leaves all the impurities of the wash water concentrated therein, while capillary absorption removes a great part of both



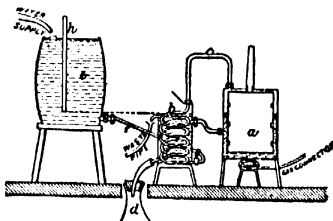
## Chemical Manipulations

### (Air Baths)

wash water and its impurities, thus conducing to the accuracy of the work.

#### Water-heated Air Baths and Ovens.

(a) The accompanying sketch of a combined steam oven and distilled water apparatus, so arranged as to be left to itself for a long period of time without the risk of the boiler going dry, may perhaps be of interest to many, and a few words only are necessary to describe the working. The steam oven, *a*, is of the ordinary construction, but is fitted at the side with a tube connecting it with the condenser, *b*. Heat is applied to *a* by means of a radial burner, connected with the gas supply by metallic tubing; the steam generated circulates around the drying chamber, escapes through the copper tube, *c*, thence through black-tin worm, and falls as distilled water in the receiver, *d*. The cistern, *c*, fitted with a Mariotte's tube, holds cold water, which falls through the tube, *f*, enters the condenser, where it rises slowly, absorbing heat from the condensing worm, until it reaches the tube leading to the boiler at a high temperature. For a cistern, an 18-gal. ale cask, supported on a stool, has been found to answer admirably, having the advantage of holding sufficient water on the top to secure the 2 corks being airtight. By a suitable adjustment of the Mariotte's tube, *h*, the rate of flow of the water can be so regulated that the level of water in the condenser is constant, or, if desired, allowed to drop slowly into the waste pipe, while the water evaporated from *a* is renewed by water



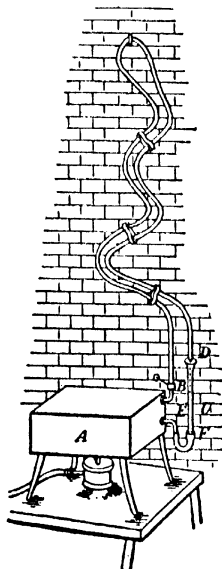
Steam Oven and Distilled Water Apparatus.

already near boiling. In practice it has been found necessary to allow the water to waste at the rate of about 2 drops per minute, the 18 gal. lasting for over 72 hours, during which time 10 to 11 gal. of distilled water are collected. When this

### (Air Baths)

apparatus was first fitted up in the laboratory, it was intended to have connected the condenser directly with the town water supply, but as the waterworks authorities would sanction no such connection, we had recourse to the cistern, with the satisfactory result that we are in this respect quite independent of the caprice of the waterworks turncock. The several connections are made by union joints, to allow the apparatus to be taken to pieces and the boiler freed from scale. The whole apparatus may be supported upon a strong shelf, which should be protected from the heat of the burner by means of slates or asbestos millboard. With this arrangement, bulky precipitates may be allowed to remain in the steam oven all night and found ready for further treatment next morning.

(b) In the annexed engraving is shown a constant water bath, consisting of a square box, *A*, supported over a Fletcher's solid flame burner. The top of the box, 15 x 15.5 in., is formed by a brass plate,  $\frac{3}{8}$  in. thick, which thus is stiff enough to

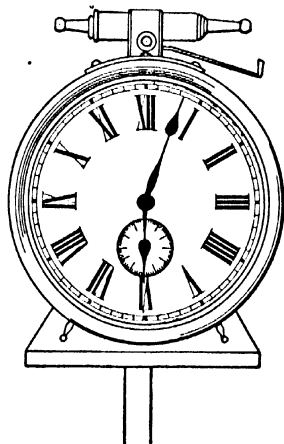


Constant Water Bath.

## Chemical Manipulations

### (Vaporization)

support a considerable weight without yielding, the sides and bottom being sheet copper. From the point, B, projects a  $\frac{1}{2}$ -in. brass tube, B C, which turns up at right angle. At E is a stop cock, which is connected by a thick rubber tube with the glass tube, D F, which is fastened against the adjoining wall. Connected with C by a rubber joint is a  $\frac{1}{2}$ -in. block tin tube of 20 ft. length, which extends up the wall in the manner shown to the highest point, T, and thence returns and ends just over the slightly funnel-shaped top of the glass tube at D. The bath being filled with water to just the level, B b, may be kept constant by boiling for many days without appreciable loss of water, the steam being condensed in its passage up, or, if uncondensed before it reaches the point, T, in its passage down the block tin tube. In flat-bottomed platinum or porcelain capsules, evaporation goes on very rapidly when placed on top of this water bath. The whole surface of the bath is nickel plated.



Automatic Cut-off for Gas for Drying Chamber.

### III VAPORIZATION

By the term "vaporization" we are to understand certain mechanical operations by which volatile substances are separated from other fixed bodies, or from bodies

### (Evaporation)

which may be less volatile, by the action of heat. When a volatile liquid is separated from a less volatile liquid, by the process of vaporization, we have what is known as evaporation. When a volatile liquid is to be collected we have what is known as distillation. When a solid is to be separated from the volatile liquid, we have what is known as desiccation, in which solid substances are deprived of moisture. Exciccation is the process by which a solid, crystalline substance is deprived of its water of crystallization, by the aid of powerful heat.

#### Granulation.

This is the process by which a powder is produced by heating a solution until the moisture has evaporated. Many salts are treated in this manner. The heat which should be applied in this process should be strong at first, and then gradually reduced. The stirring should be constant. When vaporization is used to separate a volatile solid from another body, it is known as sublimation. It can also be called a process of distilling volatile solids. It is a process which is largely used in the manufacture of chemicals, and is not so largely used in the laboratory.

#### Evaporation.

When any liquid is heated for the purpose of expelling vaporizable matter, and the process is conducted solely with a view to saving its fixed portion, the operation is termed evaporation. It thus far differs from distillation, which has for its object the preservation of the volatilized portion, in most cases, regardless of the solid. By its aid we can decrease the volume of or concentrate solutions for crystallization and chemical reaction, expel valueless volatile ingredients from those which are more fixed, obtain dissolved matter in a dry state, and prepare extracts and other pharmaceutical products.

Liquids evaporate more or less at all temperatures, those having the lowest boiling point yielding the most readily; but there are certain conditions which greatly promote this tendency. It must be remembered, therefore:

1.—That evaporation is more rapid in dry atmospheres, and that consequently the transit of a constant stream of air over the surface of the heated liquid effects a continual removal of each stratum as it becomes saturated with vapor.

2.—That evaporation is confined to the

## Chemical Manipulations

### (Evaporation)

surface, and consequently that the breadth of the evaporating vessel must be extended at the expense of its depth.

3.—That heat greatly facilitates evaporation by lessening the cohesive force of the particles of a liquid, and consequently that the evaporating vessel should present a broad surface to be heated.

4.—That a diminution of the atmospheric pressure also facilitates evaporation, for the more perfect the vacuum the lower the boiling point of a liquid.

For analytical purposes, capsules of Berlin porcelain are by far the best implements. The capsules should be very thin, with steep sides, spout for pouring, nearly flat bottomed, and glazed throughout. Watch glasses answer for small experiments, but require to be very cautiously heated, as they are readily fractured.

Beaker glasses are also used for evaporating solutions which would lose by being transferred. Broad-mouthed glass flasks are of but limited application for evaporating, and are only employed for slow processes with valuable liquids, which are liable to alteration by too much exposure when ebullition is necessary.

For the larger operations of the chemist or pharmacist, vessels of copper, tin, enamelled iron, tinned copper, and for some purposes very large porcelain capsules are more suitable.

Retorts are used when the vaporized particles are of sufficient value to be condensed, as in the process of distillation.

### Spontaneous Evaporation.

Those liquids which are very volatile or which become altered by heat, are evaporated by mere exposure to the atmosphere at its ordinary temperature. To this end they are poured into broad shallow vessels, and placed aside until the dissipation of all vaporizable matters, or until crystallization; this mode of evaporation being also employed for procuring large crystals, which are better defined than those obtained by rapid evaporation. The more dry and hot the atmosphere the more rapid is the evaporation. In order to maintain a continued contact of the face of the liquid with strata of fresh air, the vessel containing it should be placed in a draught, so that those portions of air which become saturated with vapor may be displaced. When the air might act injuriously, and a vacuum is unnecessary, a substance may be evaporated in another atmosphere, for instance, of hydrogen or carbonic acid. For this purpose it is only necessary to adjust the disengagement leg of the apparatus to the tubulure of a

### (Evaporation)

retort, so that its end may reach nearly to the level of the liquid in the latter. The generated hydrogen passes into the retort heated to the required temperature, and promotes the discharge of the vapors into a recipient attached to the back of the retort, and fitted with a small tube in its other tubulure for the disengagement of uncondensed portions.

For the evaporation of solutions of sulpho-bases, of sulpho-salts, and of all substances readily oxidizable by exposure, this process is better applicable than that with the air pump, which is apt to be attacked when the eliminated vapors are corrosive.

This process is much used in crystallization, for concentrating alterable solutions, and drying precipitates.

### Evaporation in Vacuum.

We have already referred to the happy influence of diminished atmospheric pressure in facilitating evaporation, and shall now speak of the means by which it is accomplished, and the particular instances in which it is employed.

This mode is resorted to for hastening the evaporation of all liquids, but more especially of those which are alterable by exposure.

### Evaporation by Heat in Open Air.

Having already noted the effects of heat in facilitating evaporation, we proceed to make known its modes of application. As the boiling points of solutions differ, so accordingly their evaporations are effected at varying temperatures. For example, aqueous or other solutions of unalterable matter may be evaporated over the fire; others which are destructible by heat require the intervention of baths. In whatever mode the operation is performed, the general principles are the same, and whether the vessel be a porcelain capsule or metallic pan, the greater its width in proportion to its depth the more rapid is the evaporation. Constant agitation with a stirrer is also promotive of the process.

### Evaporation Over Water and Saline Baths.

When solutions are alterable at a temperature of 212° F., the capsule or containing vessel is heated over the water bath. If it requires a higher heat, but one not exceeding 300° F., then the water must be replaced by a saline bath.

### Evaporation by Steam.

This mode has many advantages over all others, not among the least of which

## Chemical Manipulations

### (Evaporation)

is that with the aid of the generator any number of vessels may be heated simultaneously, and in any part of the laboratory, it being only necessary to have conduits of sufficient length to convey the steam to them. Moreover, convenient stop cocks allow a regulation of the heat, and consequently all danger of injury to the evaporating solution is avoided. By increasing the pressure of the steam, the temperature of the solution is also elevated.

Steam is applied through metallic coils placed at the bottom of the containing vessels, and having an exit pipe leading into the neighboring flue, or else by means of metallic casings.

#### Evaporation Over Sand Baths.

This mode is much used in analyses and for careful evaporations, requiring temperatures greater than  $212^{\circ}$ , and yet not so high as those given by the naked fire. The position and arrangement of the vessels are as directed under the head *Sand Baths*.

#### Evaporation by Heated Air.

This mode is admirably adapted for the inspissation of the natural juices of plants or for preparing dry extracts. It is also applicable to the completion of evaporations which have been carried as far as is safe over the naked fire. Porcelain plates or panes of window glass are the vessels used, and a stove or apartment for their reception heated from  $95$  to  $110^{\circ}$ , with a free draught passing through are the means of obtaining the required temperature. The juice evaporates either to thin scales or else to a spongy mass, as in the case of tannin extracted by ether, and as soon as it reaches dryness, the plates or panes are to be withdrawn, and their contents removed with a spatula.

#### Evaporation Over the Naked Fire.

The tendency of many substances to decomposition over fire, especially organic, even when in solution, renders this mode inapplicable save when the solvent and substance dissolved are both inalterable below the boiling point of the former. It is resorted to for expediting evaporations, but otherwise is far more inconvenient than steam, because of its affording less facility for the regulation of the heat and requiring greater attention. The containing vessel should be placed over a furnace of small dimensions, and its contents continually stirred with a porcelain spatula—this precaution preventing decomposition or carbonization, provided the tem-

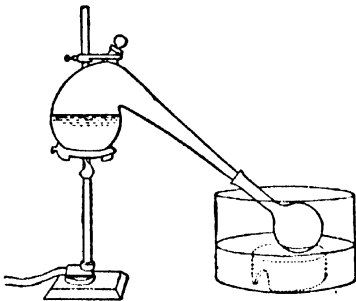
### (Distilling)

perature is not allowed to exceed the boiling point of the solvent.

In analysis and other processes, the heating implement is generally the gas or spirit lamp. The capsule filled to about  $2\frac{1}{3}$  its depth with liquid, being placed in position, the flame is applied gradually and maintained just low enough to prevent ebullition; and in order to facilitate the process, and at the same time to allay turbulence, it should be frequently stirred with a glass rod. The same directions apply when the operation is performed in a beaker glass, as is done in some analytic experiments. A cover of white paper prevents access of dust without retarding the process, but care must be taken that the contents of the vessel be not ejected against it, thus causing a loss. In evaporating to dryness, towards the end of the process the flame must be so managed as to impart a uniform heat to all parts of the thickened solution. The interposition of a very thin plate of sheet iron between the flame of the lamp and the bottom of the heating vessel is an additional means of preventing spitting. These precautions and constant stirring will prevent the loss of particles which is liable to occur upon disengagement of the last portions of liquid. If the liquid drops a powder during the operation, the vessel must be inclined, and in order to prevent spitting, heated above the deposit.

#### Distilling.

Small Apparatus for General Purposes.—(a) All ordinary distilling apparatus consists of 2 parts—one in which the heat is applied to the body to be distilled and vaporized (called the "still"), and the other into which the vapors that are



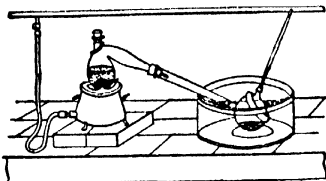
A Simple Distilling Apparatus.

## Chemical Manipulations

### (Distilling)

formed enter in order to undergo the cooling that condenses them (termed the "condenser"). One of the simplest forms of distilling apparatus used in laboratories consists of a still into which is introduced the liquid to be distilled, and which is placed upon a furnace. The neck of this fits into that of a sphere whose opening must be wide enough to allow the orifice of the still to reach the spherical part of the receiver. Finally, the sphere dips into a vessel full of cold water, and is cooled on its external surface by a wet cloth. The heated mixture begins to boil, and its vapors, escaping from the retort, cool and condense upon the cold sides of the spherical receiver. This latter serves at once as a condenser and a vessel for receiving the distilled product.

In the beginning, the empty receiver weighs less than the volume of water that it displaces, and tends to float. This may be remedied by using a sufficiently heavy ring of lead into which the neck of the receiver may be introduced, and which may rest upon the latter's bulge. Upon fixing a similar ring under the receiver, the latter will be prevented from turning laterally and even from getting broken.



Small Apparatus for General Purposes.

The water in the external vessel is renewed so as to keep it cold.

A simple arrangement of this kind is not adapted for materials that have a low boiling point, since a large proportion of the vapor escapes, and makes its exit through the neck of a receiver, which is kept hot by the vapors coming from the still. The following, which is just about as simple, is a much more perfect arrangement.

The narrow part of the still is fixed into the neck of a long, tubular receiver by means of a cork which it traverses. This annular cork exactly closes the space between the neck of the still and that of the receiver. On the other side, in the tubulure of the receiver, there is fixed by means of a cork, perforated and arranged

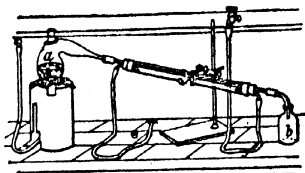
### (Distilling)

like the preceding, a long and narrow glass tube.

When the still has been filled with the substance to be distilled, and placed upon a furnace covered with wire gauze, the receiver is immersed, as above stated, in cold water. The vapors that are formed become cooled in traversing the elongated neck of the receiver, and are thoroughly condensed in the immersed part, provided the ebullition is not too rapid. In this latter case, the narrow tube, which presents the only open orifice, becomes heated, and indicates to the operator that the fire must be moderated.

The inconvenience of every apparatus of this kind is that the vapors which enter the receiver are not compelled to impinge against the sides, and may go directly to the exit-tube, or, in other words, the refrigeration is not methodical. Moreover, the refrigerating surface continues to diminish in measure as the receiver fills. Finally, if the receiver breaks, the entire distilled product comes in contact with the water. Despite these disadvantages, the rapidity with which such apparatus may be arranged, causes them to be frequently employed.

The use of refrigerators permits of a more exact and methodical condensation of the vapors. These are arranged as follows: The 2 orifices are placed in contact by means of a rubber tube, 3 to 4 cm. in length, into one end of which is introduced the neck of the retort, a, and into the other tube of the refrigerator. The latter being held in an inclined position by means of a clamp, a current of water traversing it from top to bottom, and a bent tube being adapted to its lower extremity, the free extremity of the bent one is fixed into the flask that is to collect the product. We may also suppress the central tube of the refrigerator in the flask, b, kept inclined. To facilitate this arrangement, the neck of the retort is cut at a point where it has the same external diameter as the tube of the refrigerator, and is then edged with a flame.



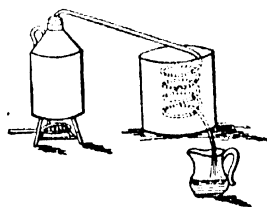
Type of Laboratory Condenser.

## Chemical Manipulations

### (Distilling)

Again, if the difference between the diameters is considerable, we may, by means of a flame, draw out slightly the one of the two tubes that is the larger, and cut it at the proper point to obtain an equality in the diameters. Finally, we may solder to the extremity of the refrigerator a cylindrical tube, 2 or 3 cm. in diameter and 6 or 7 in. length, into which is fitted the neck of the retort previously provided with a cork. This latter contains an aperture running in the direction of its axis, and the whole is arranged so as to form a tight joint.

When the substance distilled attacks cork or rubber, the neck of the retort is drawn out to a sufficient length to allow the tube that terminates it to enter the refrigerator to some depth. The rubber with which the two parts of the apparatus are connected is thus nearly out of the range of the vapors.



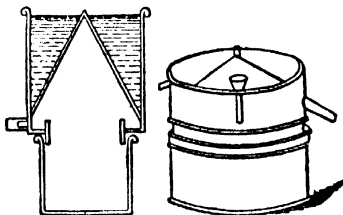
Tin Can Still.

(b) One of the simplest forms of still consists of a tin can or bottle in which the water is boiled, and to this a tin tube is adapted by means of a cork, one end of this tin tube terminating in a coil passing through a tub or other vessel of cold water. A gas burner, as shown, is a convenient source of heat, and in order to insure a complete condensation of the vapor, the water in the cooling tub must be changed now and again.

(c) Sometimes the vapor is condensed by being allowed to play against the inside of a conical cover which is adapted to a saucepan, and is kept cool by the external application of cold water; and in this case the still takes the form represented by our next engravings; the condensed water trickles down on the inside of the cone, and flows out at the spout.

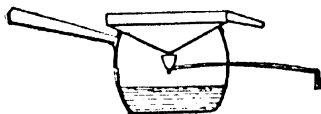
(d). An extemporized arrangement of a similar character may be made by passing a tobacco pipe through the side of a tin saucepan as shown in the engraving, and inverting the lid of the saucepan; if the

### (Distilling)

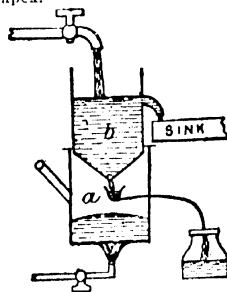


Simple Externally-Condensed Still.

lid is now kept cool by frequent changes of water inside it, and the pipe is properly adjusted, so as to catch the drippings from the convex side of the lid, a considerable quantity of distilled water may be collected in an hour or so.



(e) The apparatus shown works admirably, and is very convenient. a is a common tin saucepan, with a small hole in the side, for a tobacco pipe; b, a "steamer," on top, with a bottom like an inverted cone, 1 in. of wire being soldered at the apex.



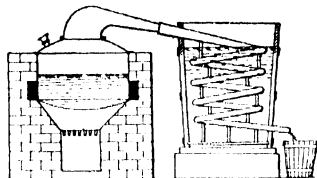
Tap-Cooled Still.

A gas jet (Bunsen's, if possible) boils the water in the saucepan; the ascending steam is condensed on the lower surface of the steamer, runs down to the point of

## Chemical Manipulations

### (Distilling)

the wire, down the pipe into the bottle. A small jet of cold water keeps b cool.

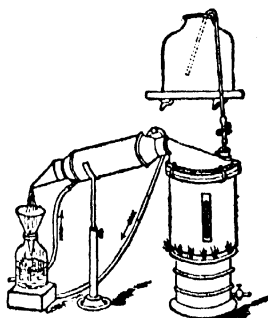


An Old Fashioned But Efficient Still.

(f) The arrangement shown is one that may readily be adapted to, and is specially suited for, the old fashioned stills which are in frequent use among pharmacists for the purpose of distilling water. The idea is extremely simple, but thoroughly efficient in actual practice. The still is thin copper, 2 gal. capacity, and the condenser is the usual worm surrounded with cold water.

#### Tinctures, Extracts, etc.

(a) A very convenient and complete still is shown herewith. The body holds



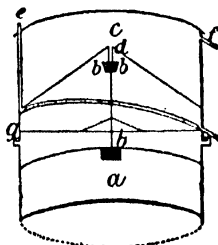
Tincture and Extract Still.

over 3 gal.; the condenser has 7 straight tubes surrounded with the cold water introduced by a hydrant or bucket of water placed higher than the still, and carried off as it becomes warmed by another tube as indicated by the arrows. By the siphon arrangement shown in the cut, it is possible to feed the still from a reservoir while distillation is in

### (Distilling)

progress, thus using a 3-gal. still where a much larger one would have been necessary. The still may be set into a kettle partly filled with water, and thus used as a water bath, or a shallow dish, with flat rim, which accompanies the still, may be placed between the two brass ring bands and clamped securely.

(b) Stevens arranged the apparatus as shown for continuous distillation. As soon as the water passes out of the boiler,



Apparatus for Continuous Distillation.

a, the float, b, lowers, letting a fresh supply of water from the condenser, c, through d, thereby keeping the water in the boiler at a constant level. This avoids the necessity of adding a large quantity of cold water at once, the effect of which would be to reduce the temperature of the water below the boiling point.

Cold water is supplied to the condenser through e, and as it becomes heated and rises to the top, it is carried off through f. The boiler and condenser are joined at g.

By leaving out the float and closing the inlet, d, with a cork, it can be used for distilling other liquids.

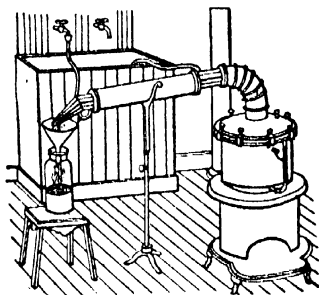
The apparatus is not patented, and should any pharmacist desire to make one for his own use, he can do so.

(c) The distilling apparatus represented herewith is intended primarily for the use of pharmaceutical chemists or druggists, but it possesses features which will recommend it to many who have need of a trustworthy and quick-acting still. The wide delivery tube is a useful feature, allowing as it does for the accumulation of vapor, and permitting the introduction of the hand. The body of the still is of wrought iron or copper, with a lid fitting on ground edges, and held together by screw clamps, as seen in the engraving. A gauge is fitted to show the quantity of

## Chemical Manipulations

### (Distilling)

liquid in the still. The condenser consists of a number of glass tubes, which, if they are 1 in. diameter and 24 in. long, expose a surface of 264 in., while that of the surrounding cylinder is only 188½ in. The ends of the condenser tubes are drawn together and tapered, as shown in cut, to permit, if desired, the collection of the distillate in a narrow-mouthed bottle. The advantage gained by this apparatus, aside from the general one of convenience, is thus seen to be in the notable increase of condensing surface it exposes, which to that extent increases the effectiveness of the device, i.e. its rapidity of action. Compared with a Liebig condenser of similar dimensions, this apparatus exposes probably 3 times as much condensing surface. The idea of a tubular condenser, employed in the manner set forth, is, in the opinion of the *American Journal of Pharmacy*, an excellent one, that may find useful imitation in the chemical laboratory and elsewhere. The device illus-



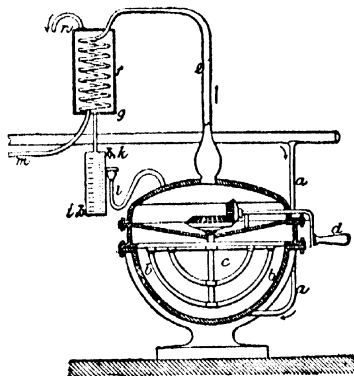
Remington's Still.

trated and described was invented by Joseph P. Remington, whose recommendation of its merits has been upon a continuous use of it for years.

(d) *Flowers, Plants or Seeds.*—To obtain the essential oils, from flowers, plants or seeds, the oleiferous material is placed in an iron, copper or glass still, of 1 to 1,000 gal. capacity, and is covered with water; superposed is a dome-shaped lid, terminating in a coil of pipe, placed in a vessel of cold water, and protruding therefrom with a tap at the end. On boiling the contents of the still, the essential oil passes over the steam, and is condensed with it in the receiver; the oil and water separate on standing. A great improvement, introduced by Drew, Heywood and

### (Distilling)

Barron, is the use of a steam-jacketed still, as shown. Steam is supplied from a boiler by the pipe, a, into the jacket, b; within the head of the still is fixed a "rouser," c, a double-branched stirrer curved to the form of the pan, and having a chain attached and made to drag over the bottom, the whole being set in motion by means of the handle, d. The still is charged, and nearly filled with



Steam Jacketed Still.

water; the head is then bolted on, steam is admitted into the jackets, the contents are well stirred, and soon the oil and steam are carried up the pipe, e, condensed in the refrigerator, f, and let out at g into the receiver, h. Here the oil and water separate, and escape by different taps. In the illustration it is supposed that the oil obtained is heavier than water; it will then sink, and be drawn out by the lower tap, i, and as soon as the water reaches the level of the upper tap, k, it will flow into the siphon funnel, l, and thence into the still. Thus the same water is repeatedly used in the still. The pipe, m, conveys cold water into the refrigerator f; the water escapes as it becomes hot by the pipe n. When the oil distilled is lighter than water, the taps, i k, exchange duties. Before commencing operations the siphon, l, is filled with water to prevent the escape of vapor.

#### Spirit.

(a) The distillation of spirit is performed for the purpose of separating the alcohol more or less from the water. The boiling point of water at the ordinary



## Chemical Manipulations

### (Distilling)

standard pressures of the atmosphere, equal to 30 in. of mercury, is  $212^{\circ}$  F. ( $100^{\circ}$  C.), that of alcohol  $173.1^{\circ}$  F. ( $78.5^{\circ}$  C.). At the sea-level, the pressure of the atmosphere may frequently vary between 28.5 and 30.5 in.; the boiling points of water corresponding to these temperatures are  $210^{\circ}$  F. and  $213^{\circ}$  F. Indeed, changes in the weather may cause the boiling point of water to vary as much as  $5^{\circ}$  F. in our climate. These alterations in pressure would cause corresponding changes in the boiling point of alcohol. If we gradually raise the temperature of alcoholic fluids to a point when vapors are freely formed, it is observed that though there is a continuous absorption of heat, yet the liquid does not increase in temperature. The heat which is absorbed during the first period is doing work of a different character from that employed subsequently. There are two phases in the process, and two different kinds of work performed by the heat employed in boiling even a kettle of water.

The first phase is indicated by a rise of temperature from  $60$  to  $212^{\circ}$  F.; the second phase by a change of state, from that of a liquid at  $212^{\circ}$  F. to a vapor at the same temperature. The quantities of heat required by different liquids in these changes varies greatly, but the variation is greatest when they pass through the second phase. Thus 1 lb. of steam at  $212^{\circ}$  F., if converted into water at  $212^{\circ}$  F., will give up heat sufficient to raise 996 lb. of water from  $60$  to  $61^{\circ}$  F. The heat rendered up by 1 lb. of alcohol vapor at  $173^{\circ}$  F. during condensation to liquid at  $173^{\circ}$  F., will heat 374.9 lb. of water from  $60$  to  $61^{\circ}$  F. These figures are sufficient to show that a small quantity of steam will boil a large quantity of alcohol. Stills of improved construction depend upon this principle.

When a mixture of alcohol and water is distilled, the liquid will not boil constantly at  $173^{\circ}$  F. until all the alcohol has passed over, but will rise in temperature gradually throughout the distillation until  $212^{\circ}$  F. have been reached. The distillate, if separated into fractions boiling between fixed points, consists of a series of mixtures of alcohol and water in definite proportions. The mixtures richest in alcohol come over first; that is to say, at the lowest temperature.

The latent heat of the vapor of a liquid with a high boiling point can be made to boil a liquid with a lower boiling point. For instance, steam at  $212^{\circ}$  F. can boil alcohol at  $173^{\circ}$  F., and alcohol at  $173^{\circ}$

### (Precipitation)

F. in turn can boil ether at  $94.8^{\circ}$  F. With a simple still, strong alcohol can be obtained from wash by repeated distillation only. Woulfe realized the fact that this wasteful and tedious process could be dispensed with by connecting together a number of rectifying chambers in such a manner that the vapor driven off from the chamber nearest the fire should be condensed in the second, and by the heat given out by its condensation cause the more volatile portions of the liquid of the second to distil into the third chamber, and those of the third into the fourth, and so on, until a sufficient degree of concentration is attained.

### IV

### PRECIPITATION AND SEPARATION

#### Edulcoration.

The affusion of water on any substance for the purpose of removing the portion soluble in that liquid. Edulcoration is usually performed by agitating or triturating the article with water, and removing the latter, after subsidence, by decantation or filtration. It is the method commonly adopted to purify precipitates and other powders which are insoluble in water. The washing bottle is a most useful instrument for the edulcoration of precipitates.

#### Precipitation.

By precipitation we are to understand a process of separating a solid substance from a solution by the action of chemicals, heat, or light. The precipitate easily drops to the bottom of the receptacle, although sometimes it may rise or be held in suspension. The solid substance is called the precipitate; the added agent which produces the effect is called the precipitant, while the liquid which remains in the vessel is called the supernatant liquid. Precipitation is one of the most valuable aids to the analytical chemist, and is constantly employed, but is also of great use in the arts. It is sometimes used to bring the substance into a powdered state; again, it is used for purification, or to separate substances which are insoluble in the liquid. It is sometimes necessary to heat the solution in order to obtain precipitation. Some preparations, such as silver salts, are precipitated by the action of light. A special precipitating jar is inexpensive, and is very convenient. The precipitated matter is usually collected with the aid of a filter and a filter paper.

## Chemical Manipulations

### (Colation)

#### Straining.

Straining is best accomplished through some textile fabric, as felt, muslin, Canton flannel, gauze, etc. Felt strainers are particularly recommended where chemical work is being done, but for the amateur's use they are apt to be expensive, as the felt takes up a great deal of the odor of the material. Canton flannel is cheap, and the bleached Canton flannel is recommended. One or two funnels or tunnels should be provided. The white enameled ones, which are imported from Sweden, are particularly recommended. Hard-rubber funnels are good for certain purposes; also copper funnels. Special funnels are provided for hot filtration, as shown in one of our engravings. This is particularly recommended when we deal with preparations containing wax, jellies, ointments, etc. The jacketed hot-water funnel is perhaps the most convenient means of obtaining heat. Steam may also be used, if available, and is both cheap and handy.

#### Colation.

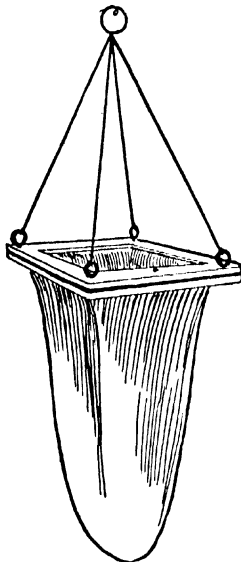
Colation or straining is a process which does not differ from filtration in principle, but the term is applied to the removal of insoluble particles of a relatively large size by passing the liquid through a medium of coarser texture than filter paper. The ordinary straining media are felt, flannel, muslin and calico, through which materials the liquid will flow with considerable rapidity.

A seamless felt straining bag is illustrated. A strainer of this kind is particularly useful for straining large quantities of syrups or liquid extracts. When in use it is suspended by means of tapes over a suitable receiver, or is supported by a frame, as is shown in the figure.

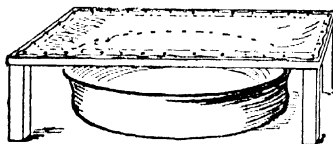
Our next engraving illustrates a form of strainer which is used when bulky precipitates are required to be filtered, washed and drained. Ferric hydroxide is precipitated in large quantities for the manufacture of the scale preparations of iron, and it is conveniently separated and washed on a piece of strong calico stretched over, and fastened by means of nails, to a rectangular wooden frame supported on short wooden legs. In this case it should be noted that the precipitate is wanted; the filtrate is allowed to run to waste.

Small quantities of liquid—an infusion or decoction, for example—may be strained through a piece of muslin or calico

### (Clarification)



Straining



Large Strainer

stretched over the top of an ordinary funnel.

#### Clarification.

Clarification is the process of separating the suspended matter contained in a liquid or semi-liquid substance without recourse to filtration. It may be effected in a variety of ways. The official method adopted for the clarification of honey, the viscid nature of which renders ordinary filtration somewhat impracticable, is the application of heat. The honey is heated on a water bath in an open, shallow dish, under which treatment it becomes much

## Chemical Manipulations

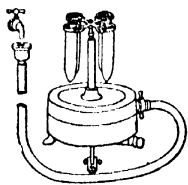
### (Centrifugation)

more fluid, and the suspended particles of solid matter rise to the surface, or sink, according to their specific gravity. By skimming, or by straining through flannel while the honey is still hot, the solid foreign particles can be easily separated out. In the same way, vegetable juices can be clarified by heat, albuminous material forming a coagulum which can be separated by filtration.

Certain liquids which are difficult to filter, and which do not yield a satisfactory filtrate, are sometimes clarified by the use of white of egg or of gelatine. In the former case a relatively small quantity of the white of egg is thoroughly mixed with the turbid liquid, and the whole is then heated to about  $80^{\circ}\text{C.}$ , at which temperature white of egg coagulates. The particles which rendered the liquid turbid are enclosed in the coagulum formed, which is easily removed from the liquid by the ordinary process of straining. Gelatine is useful, particularly when the turbidity of a liquid is due to tannin bodies, with which the gelatine readily combines to form an insoluble gelatine tannate, which can be readily removed by filtration through paper or by straining through calico.

#### Centrifugation.

By centrifugal force is meant the force exerted by any whirling body. A solid

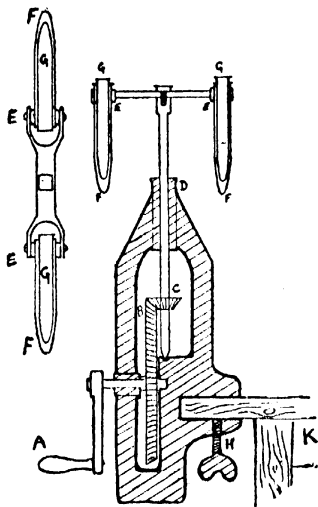


Water-Drive Centrifuge

body contained in suspension in a liquid can be readily separated by rapid rotation, the heavier particles of solid always tending to fly to the outer rim of the revolving ring of fluid. Centrifugation is thus another means of separating a solid from a liquid, and is a method especially useful when dealing with small quantities of liquid which contain in suspension minute quantities of a solid body which it is difficult to collect satisfactorily on a filter paper.

Centrifugal machines are constructed to various patterns, but the simple form

### (Centrifugation)



Centrifuge

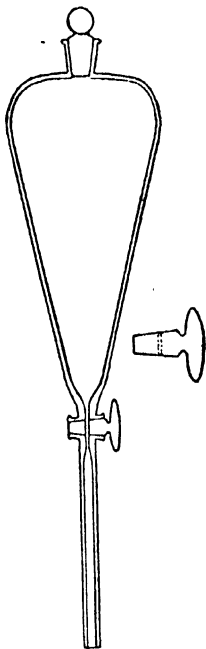
illustrated will serve to show the principle of their construction. They consist essentially of two or four, or sometimes more, glass tubes (G) enclosed in metal tube holders (F), the tubes themselves being constructed with a somewhat conical-shaped bottom. The tubeholders are swung upon a horizontal axis (E), which can be rotated at a rate of from 2,000 to 3,000 revolutions a minute. The whole apparatus is clamped firmly to the laboratory bench, as shown in the figure. When in use, the tubes are filled with the liquid so that they are equally balanced, and the machine is turned rapidly for a few minutes, at the end of which time the solid particles will be found compacted together at the bottom of the glass tube, leaving a clear layer of supernatant liquid, which can be poured off.

A centrifuge is used in the laboratory for the rapid determination of fat in milk. A measured quantity of the milk is put into a graduated centrifuge tube and a little amylac alcohol, hydrochloric acid, and some concentrated sulphuric acid are added, in order to secure a better separation of the fat. A second tube, containing a similar quantity of liquid, is placed

## Chemical Manipulations

### (Separation of Liquids)

on the opposite side of the machine in order to secure a proper balance, and the apparatus is then rotated for one or two minutes, at the end of which time all the fat will have collected in the neck of the



Separating Funnel

tube, and the percentage can be directly calculated. The centrifuge is also extremely useful for collecting for microscopical examination the deposit in a small quantity of liquid, the deposit in a sample of urine being best collected in this way.

#### The Separation of Immiscible Liquids.

The separation of two liquids which are more or less insoluble in one another is an operation important in many pharmaceutical and manufacturing processes. When relatively large quantities of immiscible liquids have to be separated, a

### (Filtration)

tubulured jar or a siphon may be used, as has been already described under DE-CANTATION; but for quantities of a few ounces some other means must be adopted.

The alkaloidal assay of the galenical preparations frequently necessitates the separation of a layer of ether or chloroform or other organic liquid from a watery solution with which it is immiscible. In the assay of opium, for example, a layer of mixed alcohol and ether has to be separated from an aqueous layer, and in this case the Pharmacopoeia directs the use of a pipette. A pipette, as shown, consists of an elongated bulbous glass tube, open at both ends, the lower end being drawn out into a narrow orifice. It is used by dipping the lower end under the surface of the top layer of liquid and applying suction with the mouth at the upper end of the tube. The bulb may be large enough to hold from 5 to 50 mls, and when as much as possible of the layer has been drawn into the bulb the moistened tip of the forefinger is placed firmly over the upper end of the tube, the liquid being thus kept from flowing out until the finger is removed. A glass syringe may be used for the same purpose as a pipette, but it is somewhat more clumsy.

#### Separating Funnels.

A more convenient means of separating layers of immiscible liquids is by the use of a glass separating funnel. An elongated pear-shaped separator, as illustrated, is a good form by means of which two liquids can be separated with greater accuracy than with a separator of a cylindrical shape.

For the separation of two liquids neither of which is particularly volatile, an ordinary glass funnel, the neck of which is provided with a stopcock, is sometimes used, but a separator of this pattern is quite unsuitable for assay processes, since it is impossible to shake the two layers together before they are set aside to separate.

#### Decolorization.

Decolorization is a process of rendering colored liquids colorless, and this is accomplished by the aid of animal charcoal or bone black. Decolorization may be accomplished in an ordinary filtering funnel or in a percolator.

#### Filtration and Other Processes of Separation.

Filtration is a process of separating a liquid from solid matter mechanically sus-

## Chemical Manipulations

### (Filtration)

ended in it, by passing it through some porous medium which does not allow the solid particles to pass through. In some cases it has for its object the collection of the suspended matter; in others it is used for obtaining the liquid in a clear state. Filtration is a simple process in principle, but in manufacturing, as well as in processes on a smaller scale, where liquids are employed, there is perhaps no operation of wider application, hence it is of great importance that the process shall be carried out in an economical and expeditious manner. Among the substances which are used as filtering media are various kinds of cloth, flannel, unglazed porous paper, engineer's waste, absorbent cotton wool, glass wool, asbestos, sand and charcoal. For small quantities of a liquid which filters easily, and in which the suspended matter is in coarse particles, a pledget of absorbent cotton wool placed in the throat of a funnel is often sufficient to produce a satisfactory filtrate. For extensive laboratory processes, however, the latter simple device is seldom of much service, for the small extent of filtering surface will soon lead to imperfect filtration, or possibly to complete blocking of the filter. The form of filter used, and the character of the filtering medium, depends not only upon the nature of the liquid to be treated, but also upon the amount of liquid that is required to be filtered.

**Filtering Media.**—Of the filtering media in common use, fine porous unglazed paper is the most universal for small operations, a piece of paper of suitable size being folded into a cone and fitted into a funnel. The funnels used for supporting filter papers are made of glass, glazed earthenware, or of metal, and those which are intended for rapid filtration are usually deeply ribbed or fluted on the inside, the space between the filter paper and the glass permitting a free passage of the filtered liquid. The same end is sometimes attained by placing thin glass rods or quills between the filter paper and the sides of the funnel. Filtering paper may be obtained in many qualities, the best quality consisting of practically pure cellulose. For the majority of purposes, white filter paper should be used, and this is made from pure flax fiber. The gray paper, on the other hand, contains a varying amount of wool, and although on account of its low cost it is used for the filtration of some galenical preparations, it is liable to color certain solutions, particularly alkaline ones, yellow. Such paper frequently contains also a

### (Filtration)

considerable amount of chlorides, calcium carbonate, and iron salts, all of which are liable to pass into solution. For analytical work, particularly in ignition processes, a Swedish filter paper of very fine quality is necessary; such filter papers, in the course of preparation, are washed with hydrofluoric and hydrochloric acids, and by this means are rendered practically free from mineral impurities, and yield, on ignition, a very minute quantity of ash.

The suitability of filter paper for ordinary pharmaceutical purposes may be determined by the application of a few simple tests. Distilled water which has been passed through the paper should leave no residue on evaporation, showing that the paper contains no soluble mineral substances. Similarly diluted hydrochloric acid, after passing through the filter paper, should give none of the reactions of the alkaline earths, while the paper should not blacken with ammonium sulphide, proving the absence of many of the metals; nor should it be colored by a solution of salicylic acid, which would indicate the presence of iron.

**Methods of Folding Filtering Papers.**—Filtering paper is sold cut into circles of varying diameter, and since these circles merely require doubling for use, they are much more convenient than the square sheets of paper, which must be trimmed after folding. Plain filters are made by doubling the circle of paper in half to form a semicircle, and then folding it again in half, so as to form a triangle, with a convex base. This, when opened out (Fig. 1), should fit exactly to the sides of a properly constructed funnel, the sides of which should be inclined at an angle of 60°. A filter paper folded in this way is good enough for many pur-

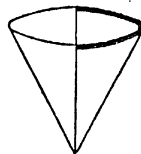


Fig. 1

poses, but it has the disadvantage of presenting three thicknesses of paper to one-half of the funnel and only one thickness to the other half; while, assuming that the funnel used has plain and not fluted sides, the filtration will not proceed with

## Chemical Manipulations

### (Filtration)

The "plaited filter" affords a means of furthering rapid filtration, and at the same time it overcomes the objection of the unequal distribution of the paper on as much rapidly, since the sides of the paper will fit closely to the glass.

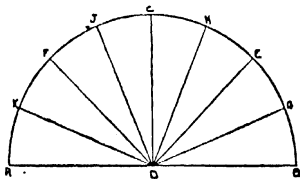


Fig. 2

the sides of the funnel. The method of folding a plaited filter can be best explained by the help of diagrams. The circle of paper must first be folded twice as directed for the plain filter, but having made the crease DC (Fig. 2), the paper is opened out again into a semi-circular form. It is next folded so that DB lies over the crease DC, and DA is likewise made to lie over DC. This operation will produce the creases DE and DF (as in Fig. 2). Next, DB must be folded over to DE and also over to DF, and in the same way DA must be folded over to DE and DF. In this way, when the paper is flattened out, it will be marked by seven creases, radiating from the center, D (as shown in Fig. 2), and the semicircle will be divided by these creases into eight segments. Up to the present all these creases have been made in the same direction, and now, to complete the filter, each segment must be divided by another crease made in a direction opposite to those already made. To effect this, DB is folded back so that it lies under DG, on the opposite face of the semicircle; in other words, the new crease DL (Fig. 3) is in an opposite di-

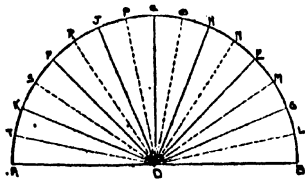


Fig. 3

### (Filtration)

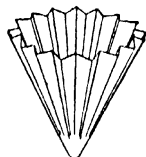


Fig. 4

rection to any of the other creases previously made. In a similar fashion, DG is folded back so that it lies under DE, producing a new crease, DM (Fig. 3), which has the same direction as the crease DL, but is in an opposite direction to DG or DE. This process is repeated until the semicircle is divided into sixteen segments by fifteen creases, the eight new creases (illustrated by dotted lines) all being in an opposite direction to the first seven creases. The paper can now be opened out, as shown in Fig. 4, and it will be found divided into thirty-two segments, two of which, situated opposite to one another, have both edges in the same direction, and in order to prevent these two segments from lying flat against the glass when the paper is placed in a funnel a new crease, pointing inward, should be made in each segment so that each of these two segments is divided into two smaller segments, bringing the total up to thirty-four. When placed in a funnel the paper will not fit closely to the glass, and thus a free passage of the filtered liquid is possible, while at the same time the entire surface of the paper will be exposed to the liquid.

When plaiting a filter, care should be taken not to crease the paper down to the extreme center of the circle (D), otherwise the apex of the filter may be so weakened as to break with the weight of the liquid poured upon it. The weakest part of a filter paper, whether plain or plaited, is always the extreme apex, and various suggestions have been made with a view to overcoming this weakness. One method is to dip the apex into strong nitric or sulphuric acid; the latter acid converts the paper into parchment paper, and thus renders it impervious to the passage of fluids, but the former treatment merely toughens the fiber of the paper. In either case care must be taken to wash the filter free from all traces of acid. The apex of a filter may also be supported by a small cone made of platinum foil, or more simply by means of a smaller filter paper folded and placed in the funnel first.

## Chemical Manipulations

### (Filtration)

or a pledget of cotton wool may be used for the same purpose. When filtering large quantities of liquid the paper is sometimes supported with calico to avoid breakage, the cloth is usually folded up with the paper, the double filter being

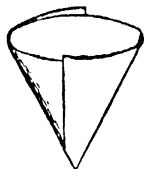


Fig. 5

placed in the funnel in the usual way. The fact that the apex of a filter paper is always a source of weakness has led to the adoption of another method of folding filter papers. The circle of paper is, as usual, first folded into a semicircle. Next, EB (Fig. 6) is folded over, with the crease in the position marked by the line EH; the point E, it will be noted, is not the center of the circle of filter paper. The paper is now turned completely over, and DA is folded over in the position marked by the line, DF, the crease,

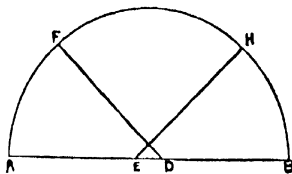


Fig. 6

DF, being, of course, in the opposite direction to the first crease, EH. When the paper is opened out (Fig. 5), it will fit into a funnel having the proper angle of  $60^\circ$ , while the apex will be strengthened by the presence of a double thickness of paper.

A liquid should never be poured in a sudden stream on to the apex of a filter paper, but should always be poured gently against the side of the filter, where, if dealing with small quantities, it may be conveniently directed by means of a glass rod (as shown in Fig. 7). In this figure the student should note the small strip of paper (A) inserted between the neck

### (Filtration)

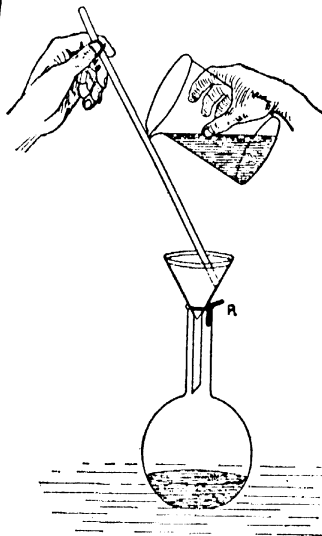


Fig. 7

of the flask and the funnel tube. This precaution is necessary if the end of the funnel fits closely into the receiver, in order that there may be a free escape of air as the filtered liquid enters the receiver. A filter paper placed in a funnel should never reach above the rim of the funnel, for, if such be the case, the liquid will be sucked by capillary attraction into the projecting edges, and there will be considerable loss by evaporation from the exposed edges. Even when the filter paper does not protrude over the rim of the funnel there is always some loss by evaporation, especially when the liquid is a particularly volatile one, and the room temperature is high. In order to lessen the loss by evaporation during a slow filtration, a piece of plate glass may be placed on the top of the funnel.

**Continuous Filtration.**—It is frequently inconvenient for an operator to give constant attention to a filtration process, hence a "self-feeding" filter is of great service. On a small scale, the following simple method, illustrated in Fig. 8, works well. An inverted Winchester quart, containing the unfiltered liquid, is arranged

## Chemical Manipulations

### (Filtration)

at such a height that the mouth of the bottle is in the liquid at the level at which it is desired to keep the funnel filled. The liquid in the funnel acts as a valve, and until air enters the bottle none of the liquid will flow out, since the atmospheric pressure is sufficient to support a column of water 32 ft. in height. As, however, the liquid in the funnel passes through the filter, it sinks in due course below the

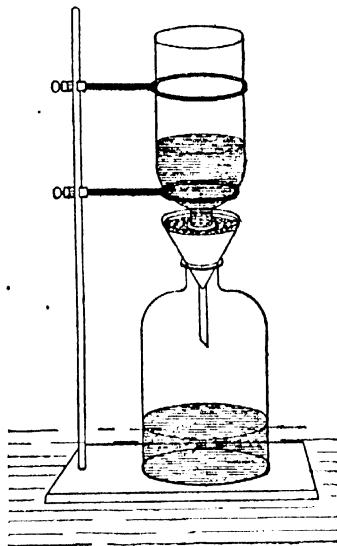


Fig. 8

level of the mouth of the bottle. Air will, consequently, enter, and at the same time a corresponding amount of the liquid will flow from the bottle into the funnel. This process will go on automatically until the bottle is empty. The method is similar to that adopted for obtaining a continuous supply of menstrum for percolation, a process which has been already described. An arrangement which is similar in principle to the above has been adopted for the continuous washing of a precipitate. In Fig. 9 is shown a specially constructed tube fitted into the neck of an inverted flask by means of an india-rubber cork. As in the case of the inverted Wilm's

### (Filtration)

the flask at E as soon as the level of the liquid in the funnel falls below the level of where the side tube joins the main tube (C), air entering the flask through the open side tube (D). The process is continuous so long as any liquid remains in the inverted flask.

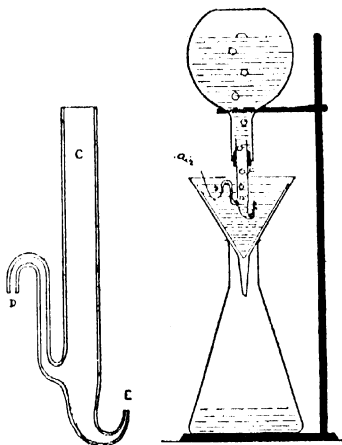


Fig. 9

**Asbestos Filters.**—In some cases, the turbidity of a liquid is due to the suspension in it of particles of matter so minute that their removal is not easily effected by the ordinary method of filtration through paper. In such cases, a clear and bright filtrate can often be obtained by shaking up with the turbid liquid some substance by means of which the minute particles are entangled, and can no longer pass through the pores of the filtering medium. For this purpose, paper pulp, prepared from waste scraps of filter paper, calcium phosphate, kieselguhr, kaolin, French chalk, magnesia, and finely shredded asbestos, have all been recommended. Whichever one of these substances is chosen, a small quantity of it is well shaken up with the liquid to be filtered, or the filter itself is first coated by shaking up a little of the filtering agent with water, pouring the mixture over the filter and allowing the latter to drain. Usually, with either method, the first few drops of the filtrate are not very clear, hence



## Chemical Manipulations

### (Filtration)

the first runnings should be returned to the filter until the filtrate is obtained bright.

For rapidly filtering turbid liquids, especially those which are cloudy from the presence of minute globules of essential oil, the "Seitz" asbestos filter has proved successful. The apparatus consists of a conical filter of fine brass-wire gauze, suitably supported. The turbid liquid is thoroughly shaken with a small quantity of finely shredded asbestos fiber, and is then transferred directly to the gauze filter. With most liquids, a rapid flow of bright, transparent filtrate is obtained.

**Hot Filtration.**—It is sometimes necessary to filter through paper substances, such as fats and waxes, which are not liquid at ordinary laboratory temperature. In such a case, a rough and ready plan is to arrange the funnel over a circular low-power gas burner (Fig. 10), but a better plan is to use a hot-water jacket for the funnel. In Fig. 11 a funnel suitable for hot filtration on a small scale is illustrated. The jacket is usually constructed of copper; at some point around the top rim there is an opening (A) through which water is introduced, and this water is kept at the desired temperature by means of a Bunsen gas burner or a spirit lamp placed under the projecting arm. In practice, the substance to be filtered is first melted, and is then poured into the funnel, which has previously been allowed to become properly heated in the copper jacket. As the heating is continued, some of the water in the jacket will be lost by evaporation, since the opening, A, must not be closed

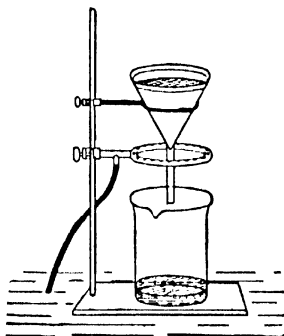


Fig. 10

### (Filtration)

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on account of the pressure which the steam would produce if this were done; hence from time to time a little more water must be poured into the jacket. Fig. 12 shows an improved type.

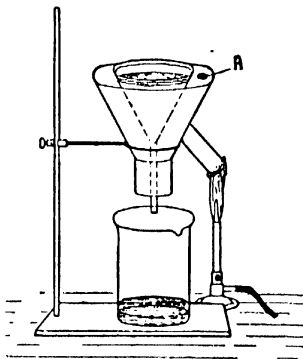


Fig. 11

**Accelerated Filtration.**—The rapidity at which filtration is effected depends upon several factors, the chief of which are: The extent of the filtering surface, the viscosity of the liquid, the porosity of the filtering medium, and the pressure or force by which the liquid is impelled through the pores of the filter.

In filtration as ordinarily carried out, the only pressure exerted is that due to the liquid itself resting on the filtering medium; but by increasing the height of this column of liquid the pressure is increased, and filtration is consequently accelerated. One of the principles of hydrostatics is that the thrust exerted by a liquid of given depth on the base of the containing vessel is independent of the shape of the remaining portion of the vessel, hence the column of liquid need not be of equal diameter throughout in order to produce uniform pressure.

Acting on this principle, a simple means of filtering oils or other liquids has been suggested. A filter bag is firmly attached to the lower end of a long tube, while to the upper end of the tube is fixed a funnel, into which is poured the liquid that is required to be filtered. Under such conditions the pressure exerted is that due to the weight corresponding to the total height of the column of liquid,

## Chemical Manipulations

### (Filtration)

and the filtrate is forced through the filter bag and collected. Instead of a filter bag an ordinary inverted funnel may be used; the filtering medium is tied securely over the broad mouth of the funnel, it being necessary always to support filter paper between layers of calico.

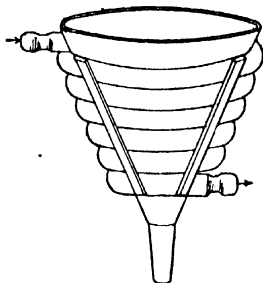
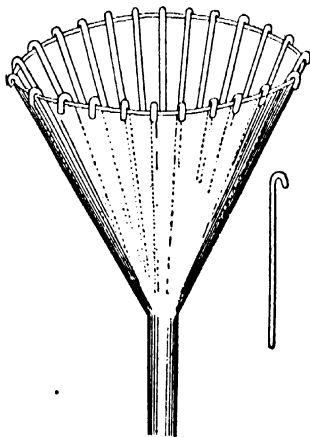


Fig. 12

#### A Device for Rapid Filtration.

Glass filter rods with a hooked end set over the edge of the ordinary funnel, form a corrugated support for filter paper, which is unaffected by liquids likely to



Glass Filter Rack

### (Percolation)

be filtered through the glass funnel, and can be effectually cleaned with a minimum of labor.

#### Percolation.

This is a kind of filtration, commonly called "by displacement," employed for extracting the essence from roots, herbs, seeds, barks, etc. It is effected in the following manner: It is first necessary that the articles to be acted upon should be ground in a drug mill to the condition of a coarse powder; then moisten the mass thoroughly with alcohol, allowing it to "macerate" for 12 hours in a vessel well covered. Next is required a hollow instrument of cylindrical form, having one end shaped like a funnel, so that it can be inserted in the neck of a glass bottle, and having inside, near the lower end, a partition pierced with numerous small holes, like the strainer of a French coffee pot, which is a simple coffee percolator; in the absence of such a partition, soft cotton, or any insoluble substance, may be substituted, and being placed in the inside at the lower end of the instrument, will answer as well as the strainer. This instrument is called a percolator. Boullay's filter or percolator is usually employed. Macerate the ingredients to be acted upon, for the time named, introduce them into the percolator, and slightly press them upon the partition. Any portion of the liquid used in the maceration not absorbed by the powder should be poured upon the mass in the instrument, and allowed to percolate. Now gradually pour into the percolator sufficient of the alcohol, or other liquid to be filtered, to drive before it, or "displace," the liquid contained in the mass; the portion introduced must, in like manner, be "displaced" by another portion, and so on till the required quantity of filtered liquor is obtained. This extract is called a tincture. In case the liquor which first passes through should be thick and turbid, again introduce it into the instrument, being very careful not to have the powder too coarse or loosely pressed, or it will permit the liquid to pass too quickly; and, on the other hand, it should not be too fine or compact, or it may offer an unnecessary resistance. Should the liquor flow too rapidly, return it to the instrument, and close it beneath for a time, and thus permit the finer parts of the powder to subside, and cause a slower percolation.

The first portion of liquid obtained by the method of displacement is always in a state of high concentration. In gen-

## Chemical Manipulations

### (Percolation)

eral, it is a simple solution of the soluble ingredients of the crude drug in the fluid employed. But sometimes the solvent, if compound, is resolved into its compound parts, and the fluid which passes through it at any given time is only one of these, holding in solution only the most soluble parts of the drug.

Thus, if diluted alcohol be poured over the powder of myrrh, in the cylinder of the percolator, the fluid which first drops into the receiver is a solution of an oily consistency, chiefly composed of resin and volatile oil dissolved in alcohol. In like manner, when the powder of gallnuts is treated in the same way by hydrated sulphuric ether, two layers of fluid are obtained, one of which is a highly concentrated solution of tannin in the water of the ether, and the other a weak solution of the same principle in pure ether. In all cases, therefore, in which it is not otherwise directed, it is absolutely necessary to agitate the several portions of the liquid obtained by percolation together, in order to insure a product of uniform strength or activity.

To illustrate the operation of displacement, and describe an excellent percolator for making perfume tinctures, we will suppose that benzoin is under treatment. The apparatus, made wholly of glass, having been arranged, as shown, and a plug



Percolator for Perfume

of raw cotton dropped loosely at a, the benzoin, in coarse powder, is then poured into the portion, b, until it reaches the line, c. Alcohol, 95%, is next added until it rises to the line, d. As soon as the first portion sinks into the benzoin a fresh addition must be made; and thus the succeeding relays go on displacing those which preceded them without mingling with them. Each stratum becomes more

### (Percolation)

and more charged with soluble matter as it descends; and when it reaches the bottom of the mass, under the pressure of the superincumbent liquor, it runs out saturated. When, by successive additions of fresh alcohol, the benzoin under treatment has become exhausted, the liquid passes through the mass and falls into the receiver, e, as tasteless and colorless as when first poured in. This indicates the completion of the process.

As atmospheric pressure is an important element in the operation, it will not answer to shut it off by closing the top of the displacer without making some compensation; and, therefore, a communication between the upper and lower vessels is established by means of a latent tube arrangement, f. In this manner the apparatus is kept close, and the evaporation of alcohol prevented, while the pressure produced is distributed throughout the apparatus, and rendered uniform. As the runnings are clear, filtration is rarely necessary. The quantity of alcohol thus consumed need not be more than sufficient to exhaust the material; and the resulting tincture must therefore be diluted to the proper strength. For perfumes, deodorized alcohol must always be used.

The method of displacement has the advantage of expedition, economy, and yielding products possessing uniformity of strength, but it requires considerable experience to adapt it to all substances. The art rests in properly packing the ingredients in the cylinder, some substances requiring considerable pressure to be used, while others, when even lightly packed, scarcely permit the fluid to pass through them. An excellent plan, applicable to all substances, but especially those of a glutinous or mucilaginous nature, is to mix the powder with an equal bulk of well washed sand before rubbing it up with the menstruum. The coarseness of the powder must also be attended to. Substances that readily become soft and pappy when wetted by the menstruum should not be used so fine as those that are more woody and fibrous. The method of displacement answers well for the preparation of all tinctures that are not of a resinous nature, and for most infusions of woody and fibrous substances, as roots, woods, barks, leaves, seeds, insects, etc. It is especially adapted for the preparation of concentrated infusions and essences, as they may thus be obtained of any required strength, without loss, or requiring concentration by heat, which is so destructive to their virtues.

When ordinary tinctures are made in

## Chemical Manipulations

### (Crystallization)

large quantities, displacement is never likely to supersede maceration on account of any practical advantages it may possess. If the prescribed directions be duly attended to, the process of maceration is unexceptionable. The process is more simple than the other; the mode of operation more uniform; it is, in fact, always the same; it requires less of skill and dexterity in conducting it; it requires less constant attention during its progress, which, in operating on large quantities, is a consideration; and finally, the apparatus required is less complicated. When, however, only small quantities are to be made at a time, and kept in stock, the adoption of the process of displacement will often be found convenient and advantageous. It offers the means of making a tincture in two or three hours, which, by the other process, would require as many weeks.

### Dialysis.

This is a process of separating substances which do not crystallize from those which do, by means of a porous diaphragm which sets in water. The apparatus which is used is called a dialyzer, which consists of a cylinder over whose bottom is secured a sheet of parchment paper. This sets in a dish of water. The liquid which is to be treated is placed in the upper dish, and the whole is put away for a time, when the separation will be found complete. This process is more useful in pharmacy than in the arts.

### Crystallization.

When a body, in the act of passing from a liquid or gaseous to a solid state, arranges itself in symmetrical forms, the process is termed crystallization, and the parts of the body so aggregated are called crystals.

By this process we can separate crystallizable from amorphous substances dissolved in the same menstrua; purify crystals from foreign and coloring matters, and in qualitative examinations be enabled to determine the composition of bodies by a reference to the characteristics of figure.

The modes of crystallization are by *fusion*, *sublimation*, *solution* and *chemical reaction*.

**Crystallization by Fusion.**—Sulphur, lead, bismuth, tin, antimony, silver, numerous alloys, anhydrous salts, and other fusible substances which are unalterable by heat, are crystallizable by *fusion*. To this end they are melted at the lowest possible temperature, and allowed to cool

### (Crystallization)

very gradually. As soon as a crust forms upon the top, which may be readily seen by the surface becoming furrowed, it must be pierced with a rod, and the still fluid portion decanted with sufficient dexterity to prevent it from cooling during the process, and at the same time from injuring the crystals coating the interior of the vessel. The liquid matter should be placed so as to be free from all vibration. The greater the mass of the material, and the more slowly it is cooled, the more voluminous and better defined will be the crystallization.

**Crystallization by Sublimation.**—Volatile solids, as iodine, camphor, several metallic chlorides and mercurial compounds, arsenic, benzoic acid, iodide of lead, etc., when heated as directed in *sublimation*, yield vapors which, in cooling, take the form of crystals.

**Crystallization from Solution.**—When it is desired to obtain a substance in crystals it must first be liquefied, or made into a *solution* with an appropriate liquid. If, after making the solution, there be any insoluble residue, it must be separated by *filtration*; and subsequently, if the solution is capable of decolorization by such means, it should be boiled with a small portion of clean bone or ivory black, and again filtered. As it is the almost universal law that heat increases the solvent power of bodies, the solution should generally be made and clarified at the boiling point, so that the excess of matter taken up at the high temperature may separate, on cooling, in the form of crystals. So long as a solution is dilute it yields no crystals; these latter are only formed when the containing liquid is supersaturated; or, in other words, holds more than it can retain; and consequently, in diminishing the quantity of the liquid by *evaporation*, we increase the density of that which remains, and hence, upon cooling, it deposits that excess of the dissolved substance which it only held by virtue of its high temperature. Some instances are so easily soluble, and to such an unlimited extent, that their solutions form crystals immediately upon cooling; others, again, are taken up with such difficulty, even at high heats, unless in large bulks of liquid, that although exposed to prolonged ebullition they require to be evaporated in order to separate what has been dissolved. As the mode of evaporating has an important influence upon the form and size of crystals, we give some hints as to the proper manner of performing it.

If large and well defined crystals are

## Chemical Manipulations

### (Emulsions)

required, the solution should be subjected to spontaneous evaporation, for the more slow and uniform the concentration the more regular and gradual will be the superposition of material required to make distinct and large crystals. A slight addition of solution of gelatine will, in some instances, it is said, give the crystals the form of plates, as in the case of boracic acid. The solution should be removed from the fire as soon as drops, withdrawn by a glass rod, and deposited upon a watch glass or clean spatula, give small crystals upon cooling. If, however, a very dense crystallization is required, the concentration may be continued until a pellicle forms upon the top, but then the solidified masses are confused and less brilliant. These essays indicate that the liquid is evaporated to a point at which it cannot retain all of its soluble matter. The vessels are then placed aside to cool gradually and uniformly, that the excess may crystallize out of the liquid. The temperature should be regular, for slight variations may alter the form of the crystals.

• Bodies equally soluble in cold and hot water, as well as those which are deliquescent, require a prolonged evaporation, as they only crystallize from very dense solutions.

When the liquid is to be converted *scholly* into solid, then the process is termed *granulation*, and is practiced by concentrating it to a syrupy consistency, removing the vessel from the fire and stirring its contents *constantly* until the mass has cooled into granules. This mode is adapted for purifying pearlsh and converting it into *sal tartar*, and also for graining brown sugars.

### Emulsions and Emulsifying.

To emulsify an oil consists in rendering it capable of mixing with water to form a uniform milky fluid, by the aid of an intervening medium, generally saccharine or mucilaginous.

Milk being the most perfect emulsion obtainable, the mixture of fat which stimulates this compound most closely must likewise be regarded as superior in the degree that these qualities are intensified. To be sure, an artificial emulsion always represents a greater percentage of fat than milk, and its preservation is, therefore, relatively easier than in that obtained from nature; but this fact merely modifies the result, and does not involve the principle. The greater proportion of water in milk also favors decomposition, but on the other hand, the minute, per-

### (Emulsions)

haps even molecular, division of the fat globules renders it possible to withstand decomposition longer than an equally dilute artificial emulsion, wherein the oil globules are not so thoroughly disseminated.

We, of course, recognize the fact that milk contains different animal bodies not present in ordinary artificial emulsions, which are prone to decomposition, so that the similarity drawn between the two is based more upon physical characteristics than their presenting any features in common chemically.

But it is this attempt at compromising its principal physical feature—fluidity—with permanency, which makes the preparation of an emulsion so difficult. To so change a fat as to render it miscible with water is a matter of easy execution, but when we attempt to embody the desirable feature of fluidity then we are thwarted by physical laws, and resort to chemical means as a compromise.

Condensed milk is a striking illustration wherein by a change of its physical condition, complete preservation has been attained much more satisfactorily than milk in its natural form could be preserved, even with chemical means. It is for this reason that *consistency* is the most desirable feature to insure the permanence and preservation of any emulsion, natural or artificial.

It is well known that a perfect and permanent emulsion can be made with cod-liver oil and malt extract, owing to the consistency of the preparation solely, as we have attempted to use the same agents represented in malt extract, namely, dextrine and glucose, and discovered that as soon as the consistency was abandoned these agents did not possess any advantage over those usually employed for emulsifying fats. To the albumen in milk has been ascribed the high degree of and most permanent emulsification, and therefore gelatine is employed in artificial emulsions, with not much better success, however, than other agents, when semi-fluid consistency is abandoned.

We will now consider what should be used as emulsifying agents, and also such as, while largely used, are not desirable, for obvious reasons.

Unfortunately, the well-worn maxim, so justly applied to most classes of pharmaceutical preparations, "The sacrifice of medicinal value for elegance," has not been lost sight of in the preparation of emulsions. Periodically, different substances from all the different kingdoms of nature have been proposed, enjoyed a

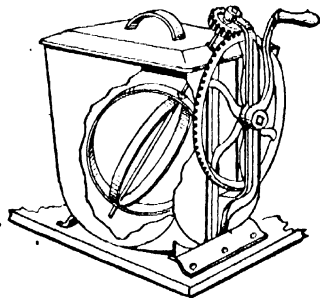
## Chemical Manipulations

### (Emulsions)

short, fashionable stay, and then been relegated to their well merited oblivion.

The vegetable gums, acacia and tragacanth, have been the longest in use, and the first mentioned of these has probably answered the purpose of a reliable, convenient, and at least innocuous emulsifying agent better than the majority of latter-day substitutes.

The late Prof. Wm. Procter announced the proportion to be used of gum acacia to produce a perfect temporary emulsion. His directions were as follows: "Mix



Emulsifier

intimately, in a perfectly dry mortar, the oil with one-half its weight of powdered acacia; to this add at once one-half as much water as the combined weight of oil and gum, and triturate briskly until the mixture has assumed the color and consistency of a thick cream, which produces a crackling noise when the pestle is moved rapidly around the sides of the mortar." This is the emulsion proper, and to this can be added any amount more of water or other desirable vehicle or medicament to bring the finished preparation up to the quantity prescribed.

If perfectly made, this emulsion will stand any degree of dilution with watery mixtures; in fact, its quality is proved when, by a large addition of water, the oil globules will not separate or aggregate at the top of the liquid.

Practice has demonstrated that the proportion of gum can be varied according to the nature of the oil employed, but the constant relation between the water used for the emulsion proper, and the mixture of oil and gum, must be scrupulously adhered to as insuring infallible results.

### (Emulsions)

Fixed oils rich in gum, *per se*, as copaiha, castor oil, etc., do not require as large an amount of gum as cod-liver oil, while in the case of ethereal oils, for instance, oil of turpentine, an equal amount of gum, or weight for weight, is necessary. To prepare an emulsion from turpentine not unfrequently presents difficulties, and so much the more is this to be guarded against, as it is a powerful remedy, and if presented in a merely mechanical mixture will prove irritating, and perhaps engender serious consequences.

But then, if by careful observation of this method we can obtain a perfect emulsion, what more is desired? Although this emulsion is perfect, it is not permanent, and to circumvent this negative feature is the problem for solution.

While we have not discovered any means or process whereby this problem can be solved, yet we have found agents capable of preventing this separation in a great degree, being guided in their selection by a knowledge of the constituents which are most favorable to this separation and those that are not.

An emulsion should be palpable, and for this reason it is always sought to make it sweet by the introduction of cane sugar or glycerine. These two agents are the cause of the most dissatisfaction with emulsions. Sugar, owing to its affinity for water, and density, favors separation very rapidly, precipitating while the emulsified oil forms a compact, creamy and gradually diminishing stratum at the top of the vessel. Glycerine, probably from the same causes, and its incompatibility with fixed oils, behaves in a similar manner, and for these reasons these otherwise desirable vehicles cannot be represented in an emulsion when permanence is to be obtained.

As no other agents present themselves for fulfilling the sweet object in view, we have been in the habit of preparing emulsions without attempting to make them sweet, and, we believe, without detracting from their palatability, while enhancing their appearance.

Now, then, let us consider what agent will favor the homogeneity of the emulsion; that is, prevent separation or precipitation, bearing in mind that the preparation must not be changed physically or chemically.

Gelatin has been used with some satisfaction, as it retards the separation for a considerable length of time; in fact, it answers the purpose so well that for the extemporaneous preparing of emulsions it leaves nothing to be desired. But in com-

## Chemical Manipulations

### (Ignition)

mon with other agents used for this purpose, it gradually loses its power of preserving the homogeneity of an emulsion, and eventually the separation and decomposition, so called, alluded to above, take place.

The proportion of gelatine employed is about 40 gr. to 1 pt. of the emulsion; it should be dissolved in the water, and added at any time of the operation. By increasing this amount so that a jelly is formed of the emulsion, a perfectly permanent and stable preparation is obtained. But this result is obtained because the physical character of the emulsion has been changed—fluidity abandoned for consistency. Unhappily, we cannot take advantage of this condition, and therefore “consistency is not a jewel” pharmaceutically.

Chemical agents such as change the character of an emulsion by saponifying the oil, have been largely advocated, and to the employment of this class of substances is principally due the elegance and permanence of ready-made emulsions. That this is attained at the sacrifice of medicinal value of the preparation we have no doubt, but medical authorities have also demonstrated it to be a questionable procedure to chemically change the constitution of a fat intended for internal administration by what should be a simple pharmaceutical process—emulsification—and now condemn the use of alkalies with balsams and resins. Copaiba is no more exhibited with solution of potash, and alkalies are generally conceded as operating to break up the sensitive electronegative principles of resins, upon which their medicinal value chiefly depends. Animal fat, and especially cod-liver oil, when rendered alkaline, undoubtedly suffers decomposition in those very constituents to which its superior digestibility is due, and thus what has been gained on one hand is more than lost on the other. The saponification which has been produced by the use of the alkali renders the preparation very prone to rancidity if exposed to the air, and even when freshly made it possesses inferior palatability; but then this has been of secondary importance to homogeneity or elegant appearance.

### V

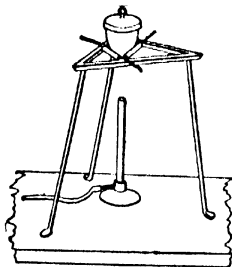
### IGNITION

Substances frequently require to be ignited to redness, either as the sole process of their preparation, or as a preliminary step to subsequent operations.

### (Ignition)

#### Ignition of Filters.

In analyses, the filters containing the insoluble or precipitated substances which are to be estimated are ignited or “burned off,” to expel carbonaceous and volatile matters, before being weighed. The im-



Heating Porcelain Crucible

plements for this purpose are porcelain or platinum crucibles, either having their appropriate application.

As it is necessary that the filter should be wholly or partially dry, it must be carefully removed from the funnel, so as not to lose a particle of its contents, compressed between the folds of bibulous paper, and, further, dried in a capsule over a sand or water bath, or in a drying stove (desiccation), at a temperature of about 200° F., or less. The dried filter is then to be transferred to the crucible, which has been previously weighed. The transfer must be made without the loss of the least particle, and for this purpose the crucible may be placed upon a sheet of glazed white paper, so that any particles that accidentally fall may be preserved. The filter should be placed in the crucible with its apex upwards, after having been freed as much as possible from the adherent precipitate by gently rubbing the sides together between the thumb and forefinger. The force used for this purpose must not be sufficient to abrade the paper, otherwise the matter will reach the fingers, and a loss thus be occasioned by adherence.

When substances are to be ignited for the determination of their hygroscopic, volatile, or organic matter, the heat of the lamp should be gradually applied without the blast, and, for the former purpose, only to the production of a dull red heat. In these instances, the crucible should be weighed first, so that the loss sustained

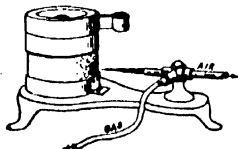
## Chemical Manipulations

### (Ignition)

by a given weight of its contents during ignition, may be ascertained in one weighing merely by subtracting the weight of the crucible and contents after ignition from the combined weight of the two before the same process. The loss gives the amount of the volatile matter.

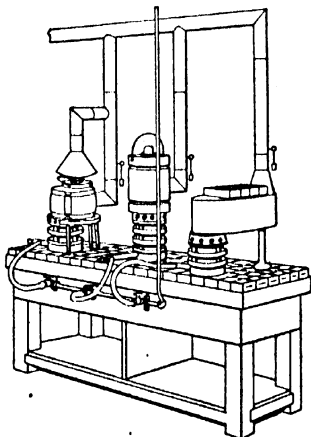
In analyses of coals, the moisture can be determined by heating the crucible in a hot sand bath, or very gently over a low flame. After the loss thus occasioned is determined by weighing, the amount of carbon may be ascertained by subjecting the crucible and contents to a much higher heat.

When the substances are to be exposed to heat, the crucible and contents must



• Gas Crucible Furnace with Air Blast.

likewise be weighed separately before ignition. The loss of weight gives the amount of volatile matter driven off. The ignited matter can then be removed from

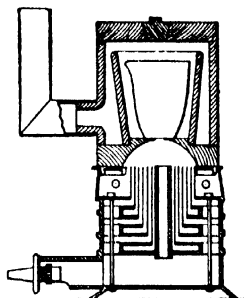


Assayer's Plant of Gas Furnaces.

### (Fusion)

the crucible by hot water alone or acidulated.

Scoriae may be removed from platinum crucibles by covering them with a paste of borax and carbonate of soda, heating them to redness, and when cold, dissolving out the saline matter with boiling water. A repetition of the process is necessary to brighten the crucible perfectly if it had been very dirty. One of our engravings represents an assaying plant of gas furnaces as arranged by Walter Lu Brour. The furnace to the right is for roasting, the middle is for crucible fusions, and to the left is one for scorification and cupellation.



Gas Crucible Furnace Without Blast.

### Fusion.

Fusion is a process of liquefying solid bodies by heat without a solvent, such as wax melting. Gas melting arrangements as shown are recommended. With this apparatus a sound 2-oz. ingot of gold or silver can be molded in 2 min. A crucible of molded carbon is supported by a sheet-iron slide or plate which is clamped to an ingot mold by a clump which swivels in the U-shaped cast-iron stand. The metal to be melted is placed in the crucible, and the flame of the blowpipe directed on it until it is perfectly fused. The whole is then tilted over by means of the upright handle at the back of the mold. The waste heat serves to make the ingot mould hot. No flux should be used with the carbon crucibles.

The plate mold will cast an ingot  $1\frac{1}{2} \times 1\frac{1}{2} \times 3-16$  in. thick; wire mold,  $3-16 \times 3-16 \times 2\frac{3}{4}$  in. long.

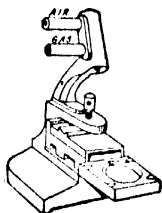
For melting up to 2 oz. of gold or silver rapidly, without the use of a furnace. In this arrangement the two parts of the



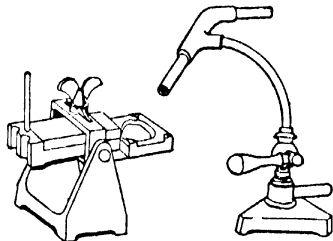
## Chemical Manipulations

### (Calcination)

ingot mold slide on each other, to enable ingots of any width to be cast, and the blowpipe is part of the rocking stand.



Ingot Casting Arrangement.



Carbon Crucible.

When the metal is melted in the shallow crucible of molded carbon, till the whole apparatus over so as to fill the ingot mold.

#### Calcination.

The separation (in a dry way) of volatile from fixed matter, by heat, is termed calcination. The process is applicable:

To the expulsion of water from salts, minerals, coals and other substances.

To the expulsion of carbonic acid from certain carbonates.

To the expulsion of arsenic and sulphur from cobalt, nickel and other sulphuretted compounds.

To the expulsion of bituminous matter from coals, and certain minerals and ores.

To the ignition of quartz and silicious minerals to promote their disintegration.

For the purpose of expelling the combined water of argillaceous minerals, and of thus rendering them more obstinate to the solvent action of acids and reagents.

If the substance under process is organic, its calcination in a close vessel by

### (Calcination)

a medium heat usually effects only partial decomposition, the gaseous matter generated escaping through interstices and the fixed components remaining with a portion of unaltered carbon. Performed in this manner, the process takes the name of coking, familiar instances of which are the formation of coke by distilling coal in closed retorts, the manufacture of charcoal from wood, and of bone black from bones.

By increasing the temperature and admitting the air, the whole of the alterable and volatile matter is expelled, the fixed matter remaining as ashes. The process is then styled incineration, and in this way the coke, charcoal and ivory black, obtained as above directed, may be entirely reduced to their incombustible portions or ashes.

*Calcination* is effected in platinum spoons or crucibles, in delicate experiments, over a spirit lamp; but in large operations a furnace is required, and the containing vessels are crucibles of either metal or earthenware, according to the nature of the substance to be heated, though the latter are often unsuitable for temperatures above a red heat.

When the operation is finished, the crucible should be taken from the fire and allowed to cool gradually. The cover is then to be lifted off and the contents taken out with a spatula, and the portions adhering to the sides removed with a feather.

If the substance undergoing calcination is fusible, it is necessary when quantities are to be ascertained, to weigh both the crucible and contents before ignition, so that the amount of volatile matter driven off may be expressed by the weight lost in heating. Water alone or acidulated, with the aid of heat, generally removes the calcined matter from the crucible.

A body deccipitating by heat should be powdered before being subjected to the process of calcination, and the temperature should be raised slowly and gradually, otherwise when the crucible is not covered, a loss may result from the ejection of particles.

To avoid contact with the generated vapors or with the atmosphere, which to some substances act as reducing agents, the crucible should in such cases be covered, and if tightly luted perforated with one or more small holes for the escape of vapor.

*Roasting* (as the term is generally used) is a kind of calcination to which many ores are submitted before their final reduction to the metallic state, for the

## Chemical Manipulations

### (Deflagration)

purpose of expelling ingredients which would either delay that process or be injurious to the metal when extracted. In this way water, carbonic acid, sulphur, selenium, arsenic, and sometimes other substances, are driven off from the ores containing them. The term is also applied to other processes, among the most important of which is that of the exposure to heat and air by which metals become altered in composition. Thus, copper becomes oxidized, and antimony and arsenic acidified by union with oxygen.

Roasting is always effected in broad, shallow open vessels, so that the air may have free access; and in order to promote the absorption of oxygen or the escape of the volatile substances, the surface of the body to be heated should be increased by previous pulverization, and it should be constantly stirred during the operation so as to present as many points of contact as possible. The most suitable vessel is a baked earthenware saucer or capsule placed in a muffle or upon the bars of a calcining furnace. Sometimes a crucible is used, and then the position of the vessel in the furnace should be slightly inclined on one side. In either case the vessels should be heated to dull redness previous to receiving their charge.

### Deflagration.

That species of roasting termed deflagration is effected by rapidly heating the substance to be oxidized, together with some additional body as an oxidizing agent, as a nitrate or chlorate for instance. The powdered mixture is added portionwise to the crucible previously heated, and maintained at redness during the operation. The vivid and sudden combustion which ensues modifies the composition of the original substance and increases its amount of oxygen at the expense of the addendum. Thus, for instance, sulphuret of arsenic is deflagrated with niter to produce arseniate of potassa, titanium and certain other metals to be transformed into oxides.

Deflagration is also used as a means of detecting the presence of nitric or chloric acids. For this purpose the suspected substance is to be heated with cyanide of potassium, in a small platinum spoon. If deflagration ensues it is a test of the presence of one of them, or a compound of one of them.

The crucibles may be of clay or metal, according to the nature of the substances to be heated. The roasting of substances for the expulsion of organic matter may be effected in platinum vessels, provided

### (Reduction)

the heat is not carried sufficiently high to produce fusion of the substance being roasted.

The heat must, at first, be very gradually applied, and at no time be made great enough to fuse or agglutinate the material, otherwise the process will have to be suspended in order to repulverize the matter. Proper care at the commencement will obviate the necessity of this additional trouble. When the heat has been cautiously raised to redness and all liability of fusion is over, the fire may be urged to the production of a yellowish red or even white heat, so that the expulsion of volatile matter may be complete.

Roasting operations which disengage deleterious or disagreeable fumes should be carried on in the open air or under a hood, and when the volatile matters are valuable they may be condensed as directed in *Distillation and Sublimation*.

### Decrepitation.

This frequently occurs and occasions loss by ejections of particles of the mixture, owing to the sudden vaporization of the water of crystallization, which in finding vent scatters the confining substances with a crackling noise. To prevent this loss, the crucible should be loosely covered until decrepitation ceases.

### Reduction.

This operation is employed for the separation of metallic bases from any bodies with which they are combined; but is generally confined to the extraction from an oxide—that being the kind of combination most commonly met with. The combined action of heat and certain reagents is required to effect this result, the temperature varying with the nature of the substance to be reduced.

The most usual reducing agents are charcoal and hydrogen gas. Tallow, oil and rosin are sometimes used, but being easily decomposed they are dissipated before entire reduction has occurred. Sugar and starch are also occasionally employed. We shall, however, confine our remarks to the two principal articles.

### Reduction by Charcoal.

Charcoal is used for this purpose in two ways, either in powder and directly mixed with the substance, or as a lining coat to the crucible in which the reduction is accomplished. The first mode is objectionable, because the excess of coal which is required to be used interferes with the agglomeration of the particles

## Chemical Manipulations

### (Sublimation)

of reduced metal. Whenever it is adopted, the quantity of coal dust to be added, which must be sufficient to transform all the oxygen of the oxide into carbonic acid, can be determined by calculation. This amount is then mixed thoroughly with the oxide previously powdered, and is transferred to a crucible, taking care to place the charge in the center and to cover the contents with a layer of the dust. The whole is then to be subjected to the heat of a furnace, assisted if necessary by a blast. The reduction in this way, the most convenient for large quantities, is rapid and complete, but the metallic residue is often mixed with coal dust.

#### Incineration.

This is a process of heating organic substances with air until all the carbon is consumed, the product sought being the ash.

#### Carbonization.

This is a process calling for the heating of organic substances without exposure to the air until all the volatile products are given off and the residue remains as a kind of charcoal. Bone black is a good example.

#### Sublimation.

When simple compound bodies which are either wholly or in part capable of assuming the aeriform state are subjected to heat, they or their most volatile constituents, upon reaching the required temperature, rise in the form of vapor. If these vapors, in their transit, are intercepted by a surface of a lower temperature, they condense and take a solid or liquid form, according to their nature. If the product is a solid, it is termed *sublimate*, and the process by which it is obtained is *sublimation*. If it is liquid or gas, it takes the name of *distillate*, and the operation which yields it that of *distillation*.

Both of these processes are indispensable in chemistry, for they afford the facility of taking advantage of the unequal volatility of bodies for their separation.

As instances of sublimation, we have calomel and corrosive sublimate made by heating equivalent proportions of sulphate of mercury and common salt; benzoic acid evolved from the gum; pure indigo from the commercial article, and camphor from the crude material. Iodine is sublimed to free it from impurities; biniodide of mercury to convert it into crystals; naph-

### (Specific Gravity)

thaline to free it from empyreumatic matter, and succinic acid to separate water.

#### Specific Gravity.

The specific weight of a substance is its weight in comparison with weights of similar bulks of other substances. This comparative heaviness of solids and liquids is conventionally expressed in relation to water; they are considered as being lighter or heavier than water. Thus, water being regarded as unity = 1, the relative weight, or specific weight, of ether is represented by the figures .720 (it is nearly three-fourths, .750, the weight of water), oil of vitriol by 1.843 (it is nearly twice, 2.000, as heavy as water). The specific weight of substances is, moreover, by generally accepted agreement, the weight of similar volumes at 15° C. (59° F.), except in the case of alcohol and wine, which are at present taken at 15.6° C. (60° F.), to maintain consistency with the United States laws and regulations; for the weight of a definite volume of any substance will vary according to temperature, becoming heavier when cooled and lighter when heated, different bodies (gases excepted) differing in their rate of contraction and expansion. While, then, specific weight—or, conventionally, specific gravity—is truly the comparative weight of equal bulks, the numbers which in America commonly represent specific gravities are the comparative weights of equal bulks at 15° (59° F.), water being taken as unity.

The true weight of the body is its weight in air plus the weight of an equal bulk of air, and minus the weight of a bulk of air equal to the bulk of brass or other weights employed; or, in other words, its weight *in vacuo* uninfluenced by the buoyancy of the air; but such a correction of the weight of a body is seldom necessary, or, indeed, desirable. Density is sometimes improperly regarded as synonymous with specific gravity. It is true that the density of a body is in exact proportion to its specific gravity, but the former is more correctly the comparative bulk of equal weights, while specific gravity is the comparative weight of equal bulks.

The standard of comparison for gases was formerly air, but is now usually hydrogen.

*Specific Gravity of Solids Lighter than Water.*—This is obtained in a manner similar to that for solids heavier than water; but the light body is sunk by help of a piece of heavy metal, the bulk of the water

# Chemical Manipulations

## SPECIFIC GRAVITY.

Tables showing a comparison of the degrees of Baumé, Cartier, and Beck's Areometers, with specific gravity degrees.

For Liquids Lighter than Water.				For Liquids Heavier than Water.			
Degrees of Baumé, Cartier, Beck.	Baumé.	Cartier.	Beck.	Degrees of Baumé, Beck.	Baumé.	Beck.	
	Sp. Gr.	Sp. Gr.	Sp. Gr.		Sp. Gr.	Sp. Gr.	
0			1.0000	0	1.000	1.0000	
1			0.9941	1	1.007	1.0059	
2			0.9883	2	1.014	1.0119	
3			0.9826	3	1.020	1.0180	
4			0.9770	4	1.028	1.0241	
5			0.9714	5	1.034	1.0303	
6			0.9659	6	1.041	1.0366	
7			0.9604	7	1.049	1.0429	
8			0.9550	8	1.057	1.0494	
9			0.9497	9	1.064	1.0559	
10	1.000		0.9444	10	1.072	1.0625	
11	0.993	1.000	0.9392	11	1.080	1.0692	
12	0.986	0.992	0.9340	12	1.088	1.0759	
13	0.979	0.985	0.9289	13	1.096	1.0828	
14	0.973	0.977	0.9239	14	1.104	1.0897	
15	0.967	0.969	0.9189	15	1.113	1.0968	
16	0.960	0.962	0.9139	16	1.121	1.1039	
17	0.954	0.955	0.9090	17	1.130	1.1111	
18	0.948	0.948	0.9042	18	1.138	1.1184	
19	0.942	0.941	0.8994	19	1.147	1.1258	
20	0.935	0.934	0.8947	20	1.157	1.1333	
21	0.929	0.927	0.8900	21	1.166	1.1409	
22	0.924	0.920	0.8854	22	1.176	1.1486	
23	0.918	0.914	0.8808	23	1.185	1.1565	
24	0.912	0.908	0.8762	24	1.195	1.1644	
25	0.906	0.901	0.8717	25	1.204	1.1724	
26	0.901	0.895	0.8673	26	1.215	1.1806	
27	0.895	0.889	0.8629	27	1.225	1.1888	
28	0.889	0.883	0.8585	28	1.235	1.1972	
29	0.884	0.877	0.8542	29	1.245	1.2057	
30	0.879	0.871	0.8500	30	1.256	1.2143	
31	0.873	0.865	0.8457	31	1.267	1.2230	
32	0.868	0.859	0.8415	32	1.278	1.2319	
33	0.863	0.853	0.8374	33	1.289	1.2409	
34	0.858	0.848	0.8333	34	1.300	1.2500	
35	0.853	0.842	0.8292	35	1.312	1.2593	
36	0.848	0.837	0.8252	36	1.324	1.2680	
37	0.843	0.831	0.8212	37	1.337	1.2782	
38	0.838	0.826	0.8173	38	1.349	1.2879	
39	0.833	0.820	0.8133	39	1.361	1.2977	
40	0.829	0.815	0.8095	40	1.375	1.3077	
41	0.824	0.810	0.8061	41	1.388	1.3178	
42	0.819	0.805	0.8018	42	1.401	1.3281	
43	0.815	0.800	0.7981	43	1.414	1.3386	
44	0.810		0.7944	44	1.428	1.3492	
45	0.806		0.7907	45	1.442	1.3600	
46	0.801		0.7871	46	1.456	1.3710	
47	0.797		0.7834	47	1.470	1.3821	
48	0.792		0.7799	48	1.485	1.3934	
49	0.788		0.7763	49	1.500	1.4050	
50	0.784		0.7727	50	1.515	1.4167	
51	0.781		0.7692	51	1.531	1.4286	
52	0.776		0.7658	52	1.546	1.4407	
53	0.771		0.7623	53	1.562	1.4530	
54	0.769		0.7589	54	1.578	1.4655	
55	0.763		0.7556	55	1.596	1.4783	
56	0.759		0.7522	56	1.615	1.4912	
57	0.755		0.7489	57	1.634	1.5044	
58	0.751		0.7456	58	1.653	1.5179	
59	0.748		0.7423	59	1.671	1.5315	
60	0.744		0.7391	60	1.690	1.5454	
61	0.740		0.7359	61	1.709	1.5596	
62	0.736		0.7328	62	1.729	1.5741	
				63	1.750	1.5888	
				64	1.771	1.6038	

## Chemical Manipulations

### (Specific Gravity)

which the latter displaces being deducted from the bulk displaced by both; the remainder is the weight of a bulk of water equal to the bulk of the light body. For instance, a piece of wood weighing 12 grams (or grains) is tied to a piece of metal weighing 22 grams, the loss of weight of the metal in water having been previously found to be 3 grams. The two, weighing 34 grams, are now immersed, and the loss in weight found to be 26 grams. But of this loss 3 grams have been proved to be due to the buoyant action of the water on the lead; the remaining 23, therefore, represent the same effect on the wood; 23 and 12, therefore, represent the weights of equal bulks of water and wood. As 23 are to 12, so is 1 to .5217. Or, shortly, as before, divide the weight in air by the weight of an equal bulk of water; .5217 is the specific gravity of the wood. Another specimen of wood may be found to be three-fourths (.750) the weight of water, and others heavier. Cork varies from .100 to .300.

The specific gravity of a very minute quantity of a heavy or light substance may be ascertained by noting the specific gravity of a fluid in which it, being insoluble, neither sinks nor swims, or by immersing it in a weighed piece of paraffine whose specific gravity is known, noting the specific gravity of the whole, and deducting the influence of the paraffine.

**Specific Gravity of Solids in Powder or Small Fragments.** Weigh the particles; place them in a counterpoised specific gravity bottle of known capacity, and fill up with water, taking care that the substance is thoroughly wetted; again weigh. From the combined weights of water and substance subtract amount due to the substance; the residue is the weight of water. Subtract this weight of water from the quantity which the bottle normally contains; the residue is the amount of water displaced by the substance. Having thus obtained the weights of equal bulks of water and substance, a rule-of-three sum shows the relation of the weight of the substance to 1 part of water—the specific gravity.

Or suspend a cup, a short tube, or bucket from a shortened balance-pan; immerse in water; counterpoise; place the weighed powder in the cup, and proceed as directed for taking the specific gravity of a solid in a mass.

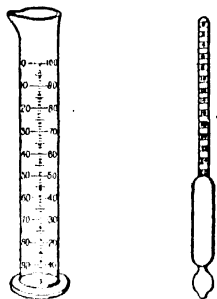
**Specific Gravity of Solids Soluble in Water.**—Weigh a piece of sugar, or other substance soluble in water; suspend it from a balance in the usual manner, and

### (Specific Gravity)

weigh it in turpentine, benzol or petroleum, the specific gravity of which is known or has been previously determined; the loss in weight is the weight of an equal bulk of the turpentine. Ascertain the weight of an equal bulk of water by calculation:

As is the specific gravity of turpentine to the specific gravity of water, so is the observed bulk of turpentine to an equal bulk of water.

The exact weights of equal bulks of sugar and water being obtained, the weight of a bulk of sugar corresponding to 1,000 of water is shown by a rule-of-three sum; in other words, divide the weight of sugar by that of the equal bulk of water; the quotient is the specific gravity of sugar. The stated specific gravity of the sugar ranges from 1.590 to 1.607.



Hydrometers and Jar

**Hydrometers.**—The specific gravity of liquids may be ascertained without scales and weights, by means of a hydrometer, an instrument usually of glass, having a graduated stem, and bulb or bulbs at the lower part. The specific gravity of a liquid is indicated by the depth to which the hydrometer sinks in the liquid, the zero of the scale marking the depth to which it sinks in pure water. Hydrometers require a considerable quantity of liquid to fairly float them, and specific gravities observed with them are less delicate and trustworthy than those obtained by the balance; nevertheless, they are exceedingly useful for many practical purposes where the employment of a delicate balance would be inadmissible.

Hydrometers are of two kinds: First, those which are always immersed in the

## Chemical Manipulations

### (Hydrometers)

same depth in still water and the liquid to be tried, small weights being used for the purpose, as in Fahrenheit's and Nicholson's hydrometers; and second, those which are suffered to rise or sink freely in the liquid, as in Syke's and Baumé's. In both cases a correction must be made for any variation in temperature.

In conducting technical experiments, the hydrometer will often be found of great use, even to those who are not chemists. The Baumé instrument seems to be falling into disuse, a hydrometer having a graduated scale in which the graduations represent the specific gravity, taking its place. A hydrometer jar and two specific gravity scale hydrometers should be used, one for liquids heavier than water, and one for liquids lighter than water. For special purposes, or if the equipment of the laboratory is large, a considerable number of hydrometers may be provided. When constructed for special purposes they often have special names. In the catalogue of a prominent manufacturer of chemical apparatus and materials we find the following special hydrometers for special purposes. The prices run from 75 cents to \$2.00, although some special types cost more, and some are only sold in sets. These special hydrometers are for testing the following substances: Alcohol, alkali, ammonia, bark (tannometer), battery fluid, beer, beer and wort, benzine, blood, chlorine, cider, coal oil, ether, gasoline, glycerine, milk (lactometer), naphtha, oil, salt solution (salinometer), silver solution, sugar, vinegar, wine and must. If the liquid is too warm, the hydrometer jar containing it should be cooled to the proper temperature; if the temperature has fallen too low, the hydrometer jar can be slightly warmed with the hand. Many of the hydrometers found in the older books have either dropped out of use, or are rarely used in this country by chemists. The Prall's hydrometer is largely used by distillers in this country, and by the Government for making alcoholic determinations. Fowdell's hydrometer is very often employed in tanneries and other technical works, especially in England. If work in specific gravity is to be performed, a spe-

### (Thermometer Scales)

cific gravity balance is recommended. The tables of specific gravity will be found in the chapter on WEIGHTS AND MEASURES. Tables of specific gravity, and the method of using the same, are presented herewith.

#### Thermometer Scales.

Much annoyance is caused by the great difference of thermometer scales in use in the different civilized countries. The scale of Reaumur prevails in Germany. As is well known, he divides the space between the freezing and boiling points into 80°. France uses that of Celsius, who graduated his scale on the decimal system. The most peculiar scale of all, however, is that of Fahrenheit, a renowned German physicist, who in 1714 or 1715, composed his scale, having ascertained that water can be cooled under the freezing point without congealing. He therefore did not take the congealing point of water, but composed a mixture of equal parts of snow and sal ammoniac, about -14° R. The conversion of any one of these scales to another is very simple, and easily made. To change a temperature, as given by Fahrenheit's scale, into the same as given by the centigrade scale, subtract 32° from Fahrenheit's degrees, and multiply the remainder by 5/9. The product will be the temperature in centigrade degrees.

To change from Fahrenheit's to Reaumur's scale, subtract 32° from Fahrenheit's degrees, and multiply the remainder by 4/9. The product will be the temperature in Reaumur's degrees.

To change the temperature, as given by the centigrade scale, into the same as given by Fahrenheit, multiply the centigrade degrees by 9/5 and add 32° to the product. The sum will be the temperature by Fahrenheit's scale.

To change from Reaumur's to Fahrenheit's scale, multiply the degrees on Reaumur's scale by 9/4 and add 32° to the product. The sum will be the temperature by Fahrenheit's scale.

For those who wish to save themselves the trouble we have calculated the following comparative table.

# Chemical Manipulations

(Thermometer Scales)

(Thermometer Scales)

## COMPARATIVE SCALES OF THERMOMETER.

C.	R.	F.	C.	R.	F.	C.	R.	F.
-30	-24.0	-22.0	14	11.2	57.2	58	46.4	136.4
-29	-23.2	-20.2	15	12.0	59.0	59	47.2	138.2
-28	-22.4	-18.4	16	12.8	60.8	60	48.0	140.0
-27	-21.6	-16.6	17	13.6	62.6	61	48.8	141.8
-26	-20.8	-14.8	18	14.4	64.4	62	49.6	143.6
-25	-20.0	-13.0	19	15.2	66.2	63	50.4	145.4
-24	-19.2	-11.2	20	16.0	68.0	64	51.2	147.2
-23	-18.4	-9.4	21	16.8	69.8	65	52.0	149.0
-22	-17.6	-7.6	22	17.6	71.6	66	52.8	150.8
-21	-16.8	-5.8	23	18.4	73.4	67	53.6	152.6
-20	-16.0	-4.0	24	19.2	75.2	68	54.4	154.4
-19	-15.2	-2.2	25	20.0	77.0	69	55.2	156.2
-18	-14.4	-0.4	26	20.8	78.8	70	56.0	158.0
-17	-13.6	1.4	27	21.6	80.6	71	56.8	159.8
-16	-12.8	3.2	28	22.4	82.4	72	57.6	161.6
-15	-12.0	5.0	29	23.2	84.2	73	58.4	163.4
-14	-11.2	6.8	30	24.0	86.0	74	59.2	165.2
-13	-10.4	8.6	31	24.8	87.8	75	60.0	167.0
-12	-9.6	10.4	32	25.6	89.6	76	60.8	168.8
-11	-8.8	12.2	33	26.4	91.4	77	61.6	170.6
-10	-8.0	14.0	34	27.2	93.2	78	62.4	172.4
-9	-7.2	15.8	35	28.0	95.0	79	63.2	174.2
-8	-6.4	17.6	36	28.8	96.8	80	64.0	176.0
-7	-5.6	19.4	37	29.6	98.6	81	64.8	177.8
-6	-4.8	21.2	38	30.4	100.4	82	65.6	179.6
-5	-4.0	23.0	39	31.2	102.2	83	66.4	181.4
-4	-3.2	24.8	40	32.0	104.0	84	67.2	183.2
-3	-2.4	26.6	41	32.8	105.8	85	68.0	185.0
-2	-1.6	28.4	42	33.6	107.6	86	68.8	186.8
-1	-0.8	30.2	43	34.4	109.4	87	69.6	188.6
0	0.0	32.0	44	35.2	111.2	88	70.4	190.4
1	0.8	33.8	45	36.0	113.0	89	71.2	192.2
2	1.6	35.6	46	36.8	114.8	90	72.0	194.0
3	2.4	37.4	47	37.6	116.6	91	72.8	195.8
4	3.2	39.2	48	38.4	118.4	92	73.6	197.6
5	4.0	41.0	49	39.2	120.2	93	74.4	199.4
6	4.8	42.8	50	40.0	122.0	94	75.2	201.2
7	5.6	44.6	51	40.8	123.8	95	76.0	203.0
8	6.4	46.4	52	41.6	125.6	96	76.8	204.8
9	7.2	48.2	53	42.4	127.4	97	77.6	206.6
10	8.0	50.0	54	43.2	129.2	98	78.4	208.4
11	8.8	51.8	55	44.0	131.0	99	79.2	210.2
12	9.6	53.6	56	44.8	132.8	100	80.0	212.0
13	10.4	55.4	57	45.6	134.6			

To change the temperature as given by the centigrade scale into the same as given by Fahrenheit, multiply the centigrade degrees by 9-5 and add 32 deg. to the product. The sum will be the temperature by Fahrenheit's scale.

To change from Reaumur's to Fahr-

heit's scale, multiply the degrees on Reaumur's scale by 9-4 and add 32 deg. to the product. The sum will be the temperature by Fahrenheit's scale.

For those who wish to save themselves the trouble we have calculated the preceding comparative table.

# Weights and Measures

## WEIGHTS AND MEASURES.

### LINEAR MEASURE.

3 barleycorns, or...	} 1 inch (in.)	
13 lines, or...		
72 points, or...		
1,000 mile (mi.)		
3 inches.....	1 palm	
4 inches.....	1 hand	
9 inches.....	1 span	
12 inches.....	1 foot (ft.)	
18 inches.....	1 cubit	
3 feet.....	1 yard (yd.)	
2½ feet.....	1 military pace	
5 feet.....	1 geometrical pace	
2 yards.....	1 fathom	
5½ yards.....	1 rod, pole, or perch	
66 feet, or.....	} 1 Gunter's chain	
4 rods.....		
40 poles, or.....	} 1 furlong (fur.)	
220 yards.....		
8 furlongs, or.....	} 1 mile	
1,760 yards, or.....		
5,280 feet.....		
3 miles.....	1 league	

The hand is used to measure horses' height. The military pace is the length of the ordinary step of a man. One thousand geometrical paces were reckoned to a mile.

### LAND MEASURE (LINEAR).

7.92 inches.....	1 link	
100 links.....	} 1 chain (ch.)	
66 feet, or.....		
22 yards, or.....		
4 poles.....	} 1 furlong (fur.)	
10 chains.....		
80 chains, or.....	} 1 mile	
8 furlongs.....		

### LAND MEASURE (SQUARE).

144 sq. inches.....	1 square foot (sq. ft.)	
9 square feet.....	1 square yard (sq. yd.)	
30¼ sq. yards.....	1 sq. pole, rod, or perch	
16 sq. poles.....	1 square chain (sq. ch.)	
40 sq. poles, or	} 1 sq. rood	
1,210 sq. yards.....		
4 roods, or.....	} 1 acre*	
10 sq. chs., or.....		
160 sq. poles, or.....		
4,840 sq. yds., or.....	} 1 sq. mile	
43,560 sq. ft.....		
640 acres, or.....		
3,097,600 sq. yds.....	} 1 yard of land	
30 acres.....		
100 acres.....		
40 hides.....		

\* The side of a square having an area of an acre is equal to 69.57 linear yards.

### CUBIC MEASURE.

1,728 cubic inches.....	1 cubic foot	
27 cubic feet.....	1 cubic or solid yard	

### DRY MEASURE, U. S.

		Cu. In.
2 pints.....	1 quart (qt.)	= 67.20
4 quarts.....	1 gallon (gal.)	= 268.80
2 gallons, or.....	} 1 peck	= 537.60
8 quarts.....		
4 pecks.....	1 struck bushel	= 2150.43

### LIQUID MEASURE, U. S.

		Cu. In.
4 gills.....	1 pint (O.)	= 28.875
2 pints.....	1 quart (qt.)	= 57.75
4 quarts.....	1 gallon (gal.)	= 231
63 gallons.....	1 hogshead (hhd.)	
2 hogsheads.....	1 pipe or butt	
2 pipes.....	1 tun	

### APOTHECARIES' LIQUID MEASURE.

Apothecaries' or Wine Measure is used by pharmacists of this country. Its denominations are gallon, pint, fluid ounce, fluid drachm, and minim, as follows:

Cong.	O.	F. Oz.	F. Dr.	Minims
1	= 8	= 128	= 1,024	= 61,440
1	= 1	= 16	= 128	= 7,680
			1	= 8
				1 = 60

The Imperial Standard Measure is used by British pharmacists. Its denominations and their relative value are:

Gal.	Quarts.	Pints.	F. Oz.	F. Dr.	Minims
1	= 4	= 8	= 160	= 1,280	= 76,800
	1	= 2	= 40	= 320	= 19,200
		1	= 20	= 160	= 9,600
			1	= 8	= 480
				1 =	= 60

The relative value of United States Apothecaries' and British Imperial Measures is as follows:

(Imperial Measure.)

U. S. Apothecaries' Measure.	Pints.	F. Oz.	F. Dr.	Minims
1 Gallon = .83311 Gallon, or	6	13	2	22.85
1 Pint = .83311 Pint, or		16	5	17.86
1 Fl. Oz. = 1.04139 Fl. Oz., or		1	0	19.86
1 Fl. Dr. = 1.04139 Fl. Dr., or			1	2.48
1 Minim = 1.04139 Minim, or				1.04

### OLD WINE AND SPIRIT MEASURE.

		Imperial Gals.
4 gills or quarterons.....	1 pint	
2 pints.....	1 quart	
4 quarts (231 cu. in.).....	1 gallon	= .8333
10 gallons.....	1 anchor	= 8.333
18 gallons.....	1 bunlet	= 15
31½ gallons.....	1 barrel	= 26.25
42 gallons.....	1 tierce	= 35
63 gallons, or.....	1 hogshead	= 52.5
2 barrels.....	} 1 puncheon	= 70
84 gallons, or.....		
1½ hogsheads.....	} 1 pipe or butt	= 105
126 gallons, or.....		
2 hogsheads, or.....	} 1 tun	= 210
1½ puncheons.....		
2 pipes or.....		
3 puncheons.....		

Apothecaries' Weight is the official standard of the United States Pharmacopœia. In buying and selling medicines not ordered by prescriptions avoirdupois weight is used.

Lb.	Oz.	Dr.	Scr	Gr.
1	= 12	= 96	= 288	= 5760
	1	= 8	= 24	= 480
		1	= 3	= 60
			1	=



## Weights and Measures

### WEIGHTS AND MEASURES—Continued

**Avoirdupois Weight.**—Used for weighing all goods except those for which troy and apothecaries' weight are employed.

Gross or Long		Ton. Cwt.		Qr.	Lb.	Oz.	Dr.
1	=	20	=	80	=	2,240	= 35,840 = 573,440
1	=	1	=	4	=	112	= 1,792 = 28,672
				1	=	28	= 448 = 7,168
						1	= 16 = 256
							1 = 16

Short or Net		Ton. Cwt.		Qr.	Lb.	Oz.	Dr.
1	=	20	=	80	=	2,000	= 32,000 = 512,000
1	=	1	=	4	=	100	= 1,600 = 25,600
				1	=	25	= 400 = 6,400
						1	= 16 = 256
							1 = 16

The "short" ton of 2,000 lbs. is used commonly in the United States. The British or "long" ton, used to some extent in the United States, contains 2,240 lbs., corresponding to a cwt. of 112 and a quarter of 28 lbs.

**Troy Weight.**—Used by jewelers and at the mints, in the exchange of the precious metals.

Lb.	Oz.	Dwt.	Gr.
1	=	12	= 240 = 5760
		1	= 20 = 480
			1 = 24

700 troy grains = 1 lb. avoirdupois.  
175 troy pounds = 144 lb. avoirdupois.  
175 troy ounces = 192 oz. avoirdupois.  
437½ troy grains = 1 oz. avoirdupois.  
1 troy pound = .8228 + lb. avoirdupois.

The common standard of weight by which the relative values of these systems are compared is the grain, which for this purpose may be regarded as the unit of weight. The pound troy and that of apothecaries' weight have each five thousand seven hundred and sixty grains; the pound avoirdupois has seven thousand grains.

The relative proportions and values of these several systems are as follows:

Troy.	Avoirdupois.
1 pound equals.....	13 2.65
1 ounce equals.....	1 1.55
1 dwt. equals.....	0 0.877

Troy.	Apothecaries'.			
	Lb.	Oz.	Dr.	Sc.
1 pound equals.....	1	0	0	0
1 ounce equals.....	0	1	0	0
1 dwt. equals.....	0	0	0	1
1 grain equals.....	0	0	0	1

Apothecaries'.	Avoirdupois.
1 pound equals.....	13 2.65
1 ounce equals.....	1 1.55
1 drachm equals.....	0 2.19
1 scruple equals.....	0 0.73

Apothecaries'.	Troy.			
	Lb.	Oz.	Dwt.	Gr.
1 pound equals.....	1	0	0	0
1 ounce equals.....	0	1	0	0
1 drachm equals.....	0	0	2	12
1 scruple equals.....	0	0	0	20

#### Avoirdupois.

	Lb.	Oz.	Dwt.	Gr.
1 long ton equals.....	2722	2	13	8
1 cwt. equals.....	136	1	6	16
1 quarter equals.....	34	0	6	16
1 pound equals.....	1	2	11	16
1 ounce equals.....		0	18	54
1 drachm equals.....		0	1	3½

#### Avoirdupois.

	Lb.	Oz.	Dwt.	Gr.
1 short ton equals.....	2430	6	13	8
1 cwt. equals.....	121	6	6	16
1 quarter equals.....	30	4	11	16

#### Avoirdupois.

	Lb.	Oz.	Dr.	Scr.	Gr.
1 pound equals.....	1	2	4	2	0
1 ounce equals.....	0	0	7	0	174
1 drachm equals.....	0	0	0	1	73½

#### DIAMOND MEASURE.

16 parts = 1 grain = 0.8 troy grain.  
4 grains = 1 carat = 3.2 troy grains.

#### TIME.

The unit of time measurement is the same among all nations. Practically it is 1/86400 of the mean solar day, but really it is a perfectly arbitrary unit, as the length of the mean solar day is not constant for any two periods of time. There is no constant natural unit of time.

1 minute	= 60 seconds.
1 hour	= 60 minutes, 3600 seconds.
1 day	= 24 hours, 1440 minutes, 86,400 seconds.
1 sidereal day	= 86164.1 seconds.
1 sidereal month	= 27.321581 mean solar days (average).
1 lunar month	= 29.530589 mean solar days (average).
1 anomalistic month	= 27.554550 mean solar days (average).
1 tropical month	= 27.321582 mean solar days (average).
1 nodical month	= 27.212222 mean solar days (average).
Mean solar year	= 365 d. 5 h. 48 m. 46.045 s. with annual variation of 0.00539.

The change in the length of the mean sidereal day, i.e., of the time of the earth's rotation upon its axis, amounts to 0.01252 s. in 2400 mean solar years.

#### ANGULAR MEASURE

60 seconds	= 1 minute
60 minutes	= 1 degree
60 degrees	= 1 sextant
90 degrees	= 1 right angle or quadrant
360 degrees	= 1 circle

#### GEOGRAPHICAL MEASURE

6087.15 feet	= 1 geographical mile
1.15287 statute miles	= 1 geographical mile
60	geographical miles = 1 degree of longitude at the Equator
69.168	statute miles = 1 degree of longitude at the Equator
360	degrees = circumference of earth at the Equator

## Weights and Measures

### DECIMAL SYSTEM—WEIGHTS AND MEASURES.

A meter is one ten-millionth of the distance from the equator to the North Pole.



The metric system, formed on the meter as the unit of length, has four other leading units, all connected with and dependent upon this. The *are*, the unit of surface, is the square of ten meters. The *liter*, the unit of capacity, is the cube of a tenth part of the meter. The *stere*, the unit of solidity, has the capacity of a cubic meter. The *gram*, the unit of weight, is the weight of that quantity of distilled water at its maximum density which fills the cube of a hundredth part of the meter. Each unit has its decimal multiple and sub-multiple, that is, weights and measures ten times larger or ten times smaller than the principal unit. The prefixes denoting the multiples are derived from the Greek, and are *deca*, ten; *hecto*, hundred; *kilo*, thousand; and *myria*, ten thousand. Those denoting sub-multiples are taken from the Latin, and are *deci*, ten; *centi*, hundred; *milli*, thousand.

Relative Value.	Length.	Surface.	Capacity.	Solidity.	Weight.
10,000.	Myriameter				
1,000.	Kilometer		Kiloliter		Kilogram
100.	Hectometer	Hectare	Hectoliter		Hectogram
10.	Decameter		Decaliter	Dekastere	Decigram
Unit.	Meter	Are	Liter	Stere	Gram
0.1.	Decimeter	Deciare	Deciliter	Decistere	Decigram
0.01.	Centimeter	Centiare	Centiliter		Centigram
0.001.	Millimeter		Milliliter		Milligram

### APPROXIMATE EQUIVALENTS OF THE FRENCH (METRIC) AND ENGLISH MEASURES.

1 yard.	$\frac{1}{3}$ meter.
11 meters.	12 yards.
To convert meters into yards.	Add $\frac{1}{4}$ th.
1 meter = 1.1 yd.; 3.3 ft.	3 ft. $\frac{3}{4}$ inches ( $\frac{1}{12}$ th less).
1 meter, by the Standards Commission.	40 inches (1.6 per cent less).
1 meter, by the Act of 1878.	— 39.38203 inches.
1 foot.	— 39.37079 inches.
1 inch.	3 decimeters (more exactly 3.048).
1 mile.	25 millimeters (more exactly 25.4).
1 kilometer.	1.6 or 17 kilometers (more exactly 1.60931)
1 chain (22 yards).	$\frac{1}{4}$ of a mile.
5 furlongs (1,100 yards).	20 meters (more exactly 20.1165).
1 square yard.	1 kilometer (more exactly 1.0058).
1 square meter.	$\frac{1}{9}$ square meter (more exactly .8361).
1 square inch.	10 $\frac{1}{4}$ square feet.
1 square mile (640 acres).	1 $\frac{1}{4}$ square yards.
1 acre (4840 square yards).	6 $\frac{1}{2}$ square centimeters (more exactly 6.45)
1 cubic yard.	260 hectares (0.4 per cent less).
1 cubic meter.	4000 square meters (1.2 per cent more).
1 cubic meter.	$\frac{1}{2}$ cubic meter (2 per cent more).
1 cubic meter of water.	1 $\frac{1}{4}$ cubic yards (1 $\frac{1}{2}$ per cent less).
1 kilogram.	35 $\frac{1}{4}$ cubic feet (.05 per cent less).
1 metric ton.	1 long ton nearly.
1 long hundredweight.	2.2 pounds fully.
1 United States hundredweight.	1 long ton nearly.
	51 kilograms nearly.
	45 $\frac{1}{4}$ kilograms nearly.

# Weights and Measures

## METRIC MEASURES.

Measures.		Metric to Customary.		Customary to Metric.		
LENGTHS.	1 Millimeter	=	0.03937 inch	1 Inch	=	25.4001 millimeters
	1 Centimeter	=	0.3937 "	1 "	=	2.54001 centimeters
	1 Meter	=	3.28083 feet	1 Foot	=	0.304801 "
	1 Kilometer	=	0.62137 mile	1 Mile	=	1.60935 kilometers
	1 Kilometer	=	0.62137 mile	1 Mile	=	1.60935 kilometers
AREAS.	1 Square Millimeter	=	0.00155 square inch	1 Square Inch	=	645.16 square millimeters
	1 Centimeter	=	0.1550 "	1 "	=	6.4516 square centimeters
	1 Meter	=	1.35 "	1 Foot	=	0.0929 "
	1 Kilometer	=	1.360 "	1 Yard	=	0.8361 "
	1 Hectare	=	2.47 acres	1 Acre	=	0.4047 hectares
VOLUMES.	1 Cubic Millimeter	=	0.000001 cubic inch	1 Cubic Inch	=	16.3872 cubic millimeters
	1 Centimeter	=	0.0610 "	1 "	=	16.3872 cubic centimeters
	1 Meter	=	35.314 "	1 Foot	=	0.02532 "
	1 Kilometer	=	1.3079 "	1 Yard	=	0.7645 "
	1 Liter	=	1.05668 quarts	1 Quart	=	0.94636 liter
CAPACITY.	1 Liter	=	0.26417 gallon	1 Gallon	=	3.78543 "
	1 Liter	=	0.9081 quart	1 Quart	=	1.1012 liters
	1 Decaliter	=	0.11551 peck	1 Peck	=	8.80982 "
	1 Hectoliter	=	1.1351 bushels	1 Bushel	=	0.8810 decaliter
	1 Liter	=	2.83774 bushels	1 Bushel	=	0.35239 hec. voliter
MASS.	1 Gram	=	15.4324 grains	1 Grain	=	0.06480 gram
	1 Kilogram	=	0.03527 ounce	1 Ounce	=	28.3495 "
	1 Gram	=	2.20462 pounds	1 Pound	=	0.45359 kilogram
	1 Kilogram	=	2.20462 pounds	1 Ounce	=	31.10348 grams
	1 Gram	=	2.67323 pounds	1 Pound	=	0.37324 kilogram
APOTHECARIES'.	1 Gram	=	0.2705 dram	1 Dram	=	3.6967 grams
	1 Gram	=	0.3115 scruple	1 Scruple	=	1.2322 "

# Weights and Measures

## STEAM PRESSURE AND TEMPERATURE.

Pressure in Lbs. per Sq. In.	Corresponding Temperature, Fahrenheit.	Pressure in Lbs. per Sq. In.	Corresponding Temperature, Fahrenheit.	Pressure in Lbs. per Sq. In.	Corresponding Temperature, Fahrenheit.
10	192.4	65	301.3	140	357.9
15	212.8	70	306.4	150	363.4
20	228.5	75	311.2	160	368.7
25	241.0	80	315.8	170	373.6
30	251.6	85	320.1	180	378.4
35	260.9	90	324.3	190	382.9
40	269.1	95	328.2	200	387.3
45	276.4	100	332.0	210	391.5
50	283.2	110	339.2	220	395.5
55	289.3	120	345.8	230	399.4
60	295.6	130	352.1	240	403.1

## TABLE OF TEMPERATURE.

Degree of Fahr.

2,786.....	Cast iron melts (Daniell).
1,990.....	Copper melts (Daniell).
1,947.....	Gold melts.
1,873.....	Silver melts (Daniell).
1,750.....	Brass (containing 25% of zinc) melts (Daniell).
1,000.....	Iron, bright cherry red (Poillet).
980.....	Red heat, visible in daylight (Daniell).
941.....	Zinc begins to burn (Daniell).
773.....	Zinc melts (Daniell).
644.....	Mercury boils (Daniell), 662 (Graham).
640.....	Sulphuric acid boils (Mauger), 620 (Graham).
630.....	Whale oil boils (Graham).
617.....	Pure lead melts (Rudberg).
600.....	Linseed oil boils.
518.....	Bismuth melts (Gmelin).
442.....	Tin melts (Crichton).
380.....	Arsenious acid volatilizes.
356.....	Metallic arsenic sublimes.
315.....	Oil of turpentine boils (Kauze).
302.....	Etherification ends.
257.....	Saturated sol. of sal ammoniac boils (Taylor).
256.....	Saturated sol. of acetate of soda boils.
239.....	Sulphur melts (Miller), 226 (Fownes).
238.....	Saturated sol. of nitre boils.
221.....	Saturated sol. of salt boils (Paris Codex).
220.....	Saturated sol. of alum, carb. soda, and sulph. zinc, boil.
218.....	Saturated sol. of chloride and prussiate potash, boil.
216.....	Saturated sol. of sulph. iron, sulph. copper, nitrate of lead, boil.
214.....	Saturated sol. of acetate lead, sulph. and bitartrate potash, boil.
213 or (213.5).....	Water begins to boil in glass.
212.....	Water boils in metal, barometer at 30".

Degree of Fahr.

211.....	Alloy of 5 bismuth, 3 tin, 2 lead, melts.
201.....	Alloy of 8 bismuth, 5 lead, 3 tin, melts (Kane).
207.....	Sodium melts (Regnault).
185.....	Nitric acid 1.52 begins to boil.
180 (about).....	Starch forms a gelatinous compound with water.
176.....	Rectified spirit boils, benzol distils.
173.....	Alcohol (sp. gr. .796 to .800) boils.
151.....	Beeswax melts (Kane), 142 (Lepage).
150.....	Pyroxylic spirit boils (Scanlan).
145.....	White of egg begins to coagulate.
141.8.....	Chloroform, and ammonia of .945, boil.
132.....	Acetone (pyroacetic spirit) boils (Kane).
122.....	Mutton suet and styracin melt.
116.....	Bisulphuret of carbon boils (Graham).
115.....	Pure tallow melts (Lepage), 92 (Thomson).
112.....	Spermuceti and stearin of hard melt.
111.....	Phosphorus melts (Miller).
98.....	Temperature of the blood.
95.....	Ether (.720) boils.
95.....	Carbolic acid crystals become an oily liquid.
88.....	Acetous fermentation ceases, water boils <i>in vacuo</i> .
77.....	Vinous ferm. ends, acetous ferm. begins.
64.4.....	Oil of anise liquefies.
59.....	Gay Lussac's <i>Alcomètre</i> graduated at.
55.....	Syrups to be kept at.
30 (about).....	Olive oil becomes partially solid.
32.....	Water freezes.
5.....	Cold produced by snow 2 parts and salt 1 part.
- 37.9.....	Mercury freezes.

—Cooley.

# Weights and Measures

WEIGHT IN POUNDS PER MILE OF COPPER WIRE.

Number.	Roeb- ling.	Bir- ming- ham.	Brown & Sharpe.	English Legal Stand- ard.	Number.	Roeb- ling.	Bir- ming- ham.	Brown & Sharpe.	English Legal Stand- ard.
0000	2.160	3.286	3.375	2.555	14	102	110	65	102
000	2.092	2.884	2.677	2.210	15	83	83	52	83
00	1.750	2.305	2.123	1.933	16	64	68	41	65
0	1.504	1.846	1.684	1.682	17	47	53½	33	50
1	1.278	1.437	1.335	1.437	18	35	38	26	37
2	1.104	1.287	1.058	1.216	19	27	28	20½	26
3	900	1.071	839	1.012	20	19½	19½	16½	20½
4	808	904	665	860	21	16½	16½	13	16½
5	684	773	528	718	22	12½	12½	10½	12½
6	588	657	418	588	23	10½	10½	8½	9½
7	500	517	332	495	24	8½	7½	6½	7½
8	419	435	263	409	25	6½	6½	5½	6½
9	350	350	209	332	26	5	5	4	5
10	291	287	166	263	27	4½	4	3½	4
11	250	230	131	215	28	4	3½	3	3½
12	176	190	104	173	29	3½	3½	2	3
13	135	144	83	135	30	3½	2½	1½	2½

WIRE GAUGES, IN DECIMAL PARTS OF AN INCH.

Number of Wire Gauge.	Roeb- ling.	Brown & Sharpe.	Bir- ming- ham or Stubbs.	Eng- lish Legal Stand- ard.	Old Eng- lish, or Lon- don.
000000	0.46			0.464	
00000	0.43			0.432	
0000	0.393	0.46	0.454	0.4	0.454
000	0.362	0.40964	0.425	0.372	0.425
00	0.331	0.3648	0.380	0.348	0.38
0	0.307	0.32495	0.340	0.324	0.34
1	0.283	0.2893	0.3	0.3	0.3
2	0.263	0.25763	0.284	0.276	0.284
3	0.244	0.22942	0.259	0.252	0.259
4	0.225	0.20431	0.238	0.232	0.238
5	0.207	0.18194	0.22	0.212	0.22
6	0.192	0.16202	0.203	0.192	0.203
7	0.177	0.14428	0.18	0.176	0.18
8	0.162	0.12849	0.165	0.16	0.165
9	0.148	0.11443	0.148	0.144	0.148
10	0.135	0.10189	0.134	0.128	0.134
11	0.12	0.09074	0.12	0.116	0.12
12	0.105	0.08081	0.109	0.104	0.109
13	0.092	0.07196	0.095	0.092	0.095
14	0.08	0.06408	0.083	0.08	0.083
15	0.072	0.05706	0.072	0.072	0.072
16	0.063	0.05082	0.065	0.064	0.065
17	0.054	0.04535	0.058	0.056	0.058
18	0.047	0.0403	0.049	0.048	0.049
19	0.041	0.03589	0.042	0.04	0.04
20	0.035	0.03196	0.035	0.036	0.035
21	0.032	0.02846	0.032	0.032	0.0315
22	0.028	0.02534	0.028	0.028	0.0285
23	0.025	0.02257	0.024	0.024	0.0227
24	0.023	0.0201	0.022	0.022	0.0225
25	0.02	0.0179	0.02	0.02	0.023
26	0.018	0.01594	0.018	0.018	0.0205
27	0.017	0.01419	0.016	0.0164	0.01875
28	0.016	0.01264	0.014	0.0148	0.0165
29	0.015	0.01125	0.013	0.0136	0.0155
30	0.014	0.01003	0.012	0.0124	0.01375
31	0.0135	0.00983	0.010	0.0116	0.01225
32	0.013	0.00795	0.009	0.0108	0.01125
33	0.011	0.00708	0.008	0.01	0.01025
34	0.01	0.0063	0.007	0.0092	0.0095
35	0.0095	0.00561	0.005	0.0084	0.009
36	0.009	0.005	0.004	0.0076	0.0075

TABLE INDICATING SIZE, WEIGHT, AND LENGTH OF IRON AND STEEL WIRE.

Gauge Num- bers.	Diam- eter, Ins.	Weight of 100 Feet. Lbs.	Weight of One Mile. Lbs.	Feet in 2000 Lbs.	Area, Square Ins.
3-0	.362	34.73	1834	5,759	102921
2-0	.331	29.04	1533	6,886	086049
1-0	.307	25.00	1318	8,000	074023
1	.283	21.23	1121	9,425	062901
2	.263	18.34	968	10,905	054525
3	.244	15.78	833	12,674	046759
4	.225	13.39	707	14,936	039760
5	.207	11.35	599	17,621	033653
6	.192	9.73	514	20,555	028952
7	.177	8.30	439	24,906	024605
8	.162	6.96	367	28,734	020612
9	.148	5.80	306	34,483	017203
10	.135	4.83	255	41,408	014313
11	.120	3.82	202	52,359	011309
12	.105	2.92	154	68,493	008659
13	.092	2.24	118	89,286	006647
14	.080	1.69	89	118,343	005020
15	.072	1.37	72	145,985	004071
16	.063	1.05	55	190,476	003117
17	.054	0.77	41	259,740	002290
18	.047	0.58	31	344,827	001734
19	.041	0.45	24	444,444	001320
20	.035	0.32	17	625,000	000962
21	.032	0.27	14	740,741	000804
22	.028	0.21	11	952,381	000615
23	.025	0.175	9.24	1,111,111	000484
24	.023	0.140	7.39	1,322,778	000415
25	.020	0.116	6.124	1,574,803	000314
26	.018	0.093	4.91	1,886,792	000254
27	.017	0.083	4.382	2,222,222	000227
28	.016	0.074	3.907	2,608,701	000201
29	.015	0.061	3.22	3,125,000	000176
30	.014	0.054	2.851	3,571,429	000154
31	.0135	0.050	2.64	4,074,074	000143
32	.013	0.046	2.428	4,629,630	000132
33	.011	0.037	1.953	5,555,556	000095
34	.010	0.030	1.584	6,666,667	000078
35	.0095	0.028	1.32	7,692,308	000071
36	.009	0.021	1.161	8,888,889	000064

# Weights and Measures

## APPROXIMATE PERCENTAGE VARIATION IN RESISTANCE AT ABOUT 20° C. (68° F.)

Metal or Alloy.	(a) Per 1° C.	(a) Per 1° F.
Platinum Silver (1 pt. Platinum to 2 pts. Silver), hard or annealed.	0.031	0.017
German Silver, hard or annealed.	0.044	0.024
Mercury.	0.072	0.040
Tinmith, pressed.	0.354	0.197
Gold, annealed.	0.365	0.203
Zinc, pressed.	0.365	0.203
Tin.	0.365	0.203
Silver, annealed.	0.377	0.209
Lead, pressed.	0.387	0.215
Copper, annealed.	0.428	0.238
Iron (about).	0.5	0.278

## HEAT AND ELECTRICAL CONDUCTIVITY.

Substances.	Heat Conductivity.	Electrical Conductivity.
Silver.	100.0	100.0
Copper.	73.6	73.3
Gold.	53.2	58.5
Brass.	23.6	21.5
Zinc.	19.9	...
Tin.	14.5	22.6
Steel.	12.0	...
Iron.	11.9	13.0
Lead.	8.5	10.7
Platinum.	6.4	10.3
Palladium.	6.3	...
Bismuth.	1.8	1.9

## RESISTANCE AND WEIGHT TABLE.

American gauge for cotton and silk-covered and bare copper wire.—The resistances are calculated for pure copper wire.

The number of feet to the pound is only approximate for insulated wire.

No.	Diameter.	Feet per Pound.			Resistance, Naked Copper.			
		Cotton Covered.	Silk Covered.	Naked.	Ohms per 1,000 Feet.	Ohms per Mile.	Feet per Ohm.	Ohms per Pound.
8	.12849			20	.0259	3.3	1600	.0125
9	.11443			25	.7892	4.1	1272	.0197
10	.10189			32	.8441	4.4	1185	.0270
11	.09074			40	1.254	6.4	798	.0501
12	.08081	42	46	50	1.580	8.3	633	.079
13	.07190	55	60	64	1.995	10.4	504	.127
14	.06408	68	75	80	2.504	13.2	400	.200
15	.05707	87	95	101	3.172	16.7	316	.320
16	.05082	110	120	128	4.001	23	230	.512
17	.04525	140	150	161	5.04	26	198	.811
18	.0403	175	190	203	6.36	33	157	1.29
19	.03539	220	240	256	8.25	43	121	2.11
20	.03190	280	305	324	10.12	53	99	3.27
21	.02846	360	390	408	12.78	68	78.5	5.20
22	.02535	450	490	514	16.25	85	61.8	8.35
23	.02257	560	615	649	20.30	108	48.9	13.3
24	.0201	715	775	818	25.60	135	39.0	20.9
25	.0179	910	990	1,030	32.2	170	31.0	33.2
26	.01594	1,165	1,265	1,300	40.7	214	24.6	52.9
27	.01419	1,445	1,570	1,640	51.3	270	19.5	84.2
28	.01264	1,810	1,970	2,070	64.8	343	15.4	134
29	.01126	2,280	2,460	2,617	81.6	432	12.2	213
30	.01002	2,805	3,050	3,287	103	538	9.8	338
31	.00893	3,605	3,920	4,144	130	685	7.7	539
32	.00795	4,535	4,930	5,227	164	865	6.1	856
33	.00708		6,200	6,590	206	1033	4.9	1357
34	.0063		7,850	8,330	260	1389	3.8	2166
35	.00561		9,830	10,460	328	1820	2.9	3521
36	.005		12,420	13,210	414	2200	2.4	5460

## Weights and Measures

### SIZES OF DRY PLATES.

3½ × 4½ inches	8 × 10 inches
4½ × 5½ "	10 × 12 "
4½ × 6½ "	11 × 14 "
4½ × 6½ "	14 × 17 "
4½ × 6½ "	16 × 20 "
5 × 7 "	17 × 20 "
5 × 8 "	18 × 22 "
6½ × 8½ "	20 × 24 "

### SIZES IN FRANCE AND GERMANY.

6½ × 9 cm	2.5 × 3.6 inches
9 × 12 "	3.6 × 4.7 "
12 × 15 "	4.7 × 5.9 "
13 × 18 "	5.1 × 7.0 "
13 × 20 "	4.7 × 7.8 "
15 × 21 "	5.9 × 8.2 "
15 × 22 "	5.9 × 8.6 "
18 × 24 "	7.0 × 9.4 "
21 × 29 "	8.2 × 10.6 "
24 × 30 "	9.4 × 11.8 "
27 × 33 "	10.6 × 12.9 "
27 × 35 "	10.6 × 13.7 "
30 × 40 "	11.8 × 15.7 "
40 × 50 "	15.7 × 19.6 "
50 × 60 "	19.6 × 23.6 "

### SIZES IN ITALY.

9 × 12 cm	3.6 × 4.7 inches
12 × 16 "	4.7 × 6.3 "
12 × 18 "	4.7 × 7.0 "
13 × 18 "	5.1 × 7.0 "
12 × 20 "	4.7 × 7.8 "
18 × 24 "	7.0 × 9.4 "
21 × 29 "	8.2 × 10.6 "
24 × 30 "	9.4 × 11.8 "
27 × 33 "	10.6 × 12.9 "
30 × 36 "	11.8 × 14.1 "
40 × 50 "	15.7 × 19.6 "
50 × 60 "	19.6 × 23.6 "

Air.—The following data are useful in calculations relating to air:

1. To find the quantity of nitrogen by volume corresponding to 1 volume of oxygen, multiply by 3.770992.

2. To find the quantity of oxygen by volume corresponding to 1 volume of nitrogen, multiply by 0.265182.

3. To find the quantity of nitrogen by weight corresponding to 1 part by weight of oxygen, multiply by 3.313022.

4. To find the quantity of oxygen by weight corresponding to 1 part by weight of nitrogen, multiply by 0.301839.

5. To find the quantity of nitrogen by volume corresponding to 1 part by weight of oxygen, multiply by 2.6365411.

6. To find the quantity of oxygen by volume corresponding to 1 part by weight of nitrogen, multiply by 0.2730071.

7. To find the quantity of nitrogen by weight corresponding to 1 part by volume of oxygen, multiply by 3.6629154.

8. To find the quantity of oxygen by weight corresponding to 1 part by volume of nitrogen, multiply by 0.3792848.

To TEST AIR FOR SEWER GAS.—Saturate unglazed paper with a solution of 1 oz. of pure lead acetate in half a pint of rain water; let it partially dry, then expose in the room suspected of containing sewer gas. The presence of the latter in any considerable quantity soon darkens or blackens the test paper.

Table of Decimal Equivalents.—Of 8ths, 16ths, 32ds, and 64ths of an inch.

1/8 = .125000	1/16 = .062500	1/32 = .031250	1/64 = .015625
2/8 = .250000	2/16 = .125000	2/32 = .062500	2/64 = .031250
3/8 = .375000	3/16 = .187500	3/32 = .093750	3/64 = .046875
4/8 = .500000	4/16 = .250000	4/32 = .125000	4/64 = .062500
5/8 = .625000	5/16 = .312500	5/32 = .156250	5/64 = .078125
6/8 = .750000	6/16 = .375000	6/32 = .187500	6/64 = .093750
7/8 = .875000	7/16 = .437500	7/32 = .218750	7/64 = .109375
8/8 = 1.000000	8/16 = .500000	8/32 = .250000	8/64 = .125000
9/8 = 1.125000	9/16 = .562500	9/32 = .281250	9/64 = .140625
10/8 = 1.250000	10/16 = .625000	10/32 = .312500	10/64 = .156250
11/8 = 1.375000	11/16 = .687500	11/32 = .343750	11/64 = .171875
12/8 = 1.500000	12/16 = .750000	12/32 = .375000	12/64 = .187500
13/8 = 1.625000	13/16 = .812500	13/32 = .406250	13/64 = .203125
14/8 = 1.750000	14/16 = .875000	14/32 = .437500	14/64 = .218750
15/8 = 1.875000	15/16 = .937500	15/32 = .468750	15/64 = .234375
16/8 = 2.000000	16/16 = 1.000000	16/32 = .500000	16/64 = .250000

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